FREE 3-D GLASSES

AN ASTRONOMER'S TOUR OF HOLLYWOOD

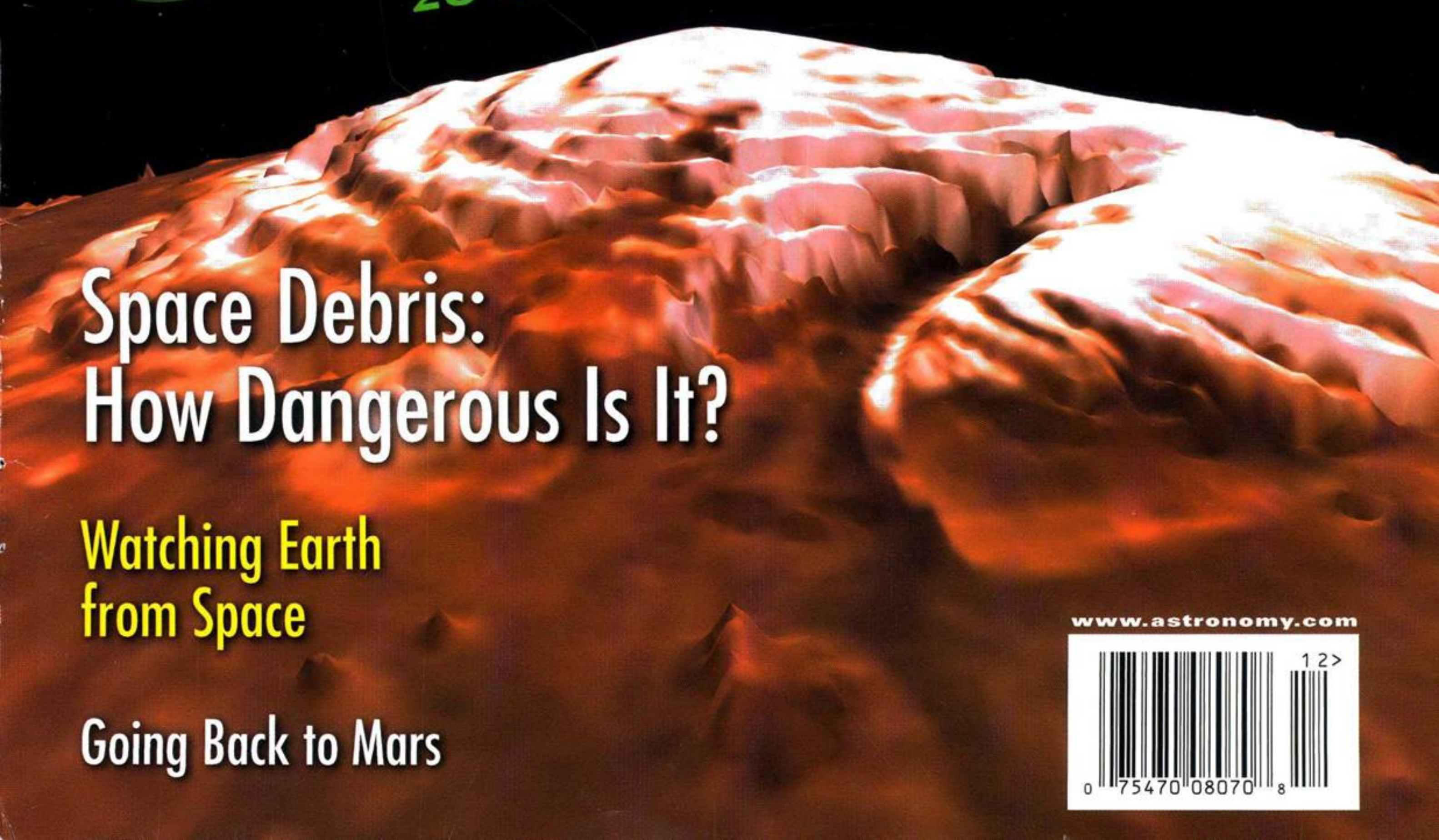
CMG 08070

Astronomy®

AMERICA'S BEST-SELLING ASTRONOMY MAGAZI
December 2000 • $4.50
U.K. £2.70
Can. $6.50

3-D UNIVERSE

28 Breathtaking Photos



Space Debris: How Dangerous Is It?

Watching Earth from Space

Going Back to Mars

www.astronomy.com
12>
0 75470 08070 8

MEADE
LX90
MEADE LX90 EMC
MEADE

Now you can buy the telescope of a lifetime at a price you probably never thought possible.

The Meade 8" LX90, with diffraction-limited Meade optics in an Autostar™ computer-controlled telescope system, includes capabilities not available on other brands of 8" Schmidt-Cassegrains costing hundreds of dollars more. And, at $1695, the 8" LX90 — *with more than twice the light-gathering power* — is priced only a few hundred dollars more than competing *5"* Schmidt-Cassegrains!

Advanced capability incorporating the optical system and coatings of the 8" LX200, and with 5 arc-minute pointing precision in the GO TO mode. An instrument fully qualified for long-exposure CCD imaging and astrophotography as well as for other advanced photo-visual applications.

Special LX90 features include: (a) a die-cast-aluminum *double-tine* fork mount that rigidly supports the optical tube in all sky orientations; (b) *worm gears* of 4.9"-diameter on both telescope axes for smooth sidereal-rate tracking of celestial objects as well as precise guiding corrections during long-exposure imaging; (c) a rigid chromed-steel variable-height field tripod — *the same tripod provided with Meade LX200 models.*

Autostar Computer Controller: The LX90's *standard-equipment* Autostar controller connects to the telescope's control panel and permits an incredible array of telescope features:

- *Automatic GO TO capability* at 6.5°/sec on both axes, simultaneously, to 30,223 database objects, including:

  13,235 deep-sky objects — the complete Messier, Caldwell, IC, and NGC catalogs; 16,888 stars sorted by name and SAO catalog numbers; 8 major planets from Mercury to Pluto; the Moon; 26 asteroids; 15 comets; 50 Earth satellites; plus 200 memory locations for user-defined objects.
- *Automatic GO TO capability* to *any* object of known R.A. and Declination. Plus hundreds of special event menus, guided tours, utility functions, and telescope status options.
- *Nine selectable slew speeds:* 6.5°/sec, 3°/sec, and 1.5°/sec, as well as 128x, 64x, 16x, 8x, 2x, and 1x sidereal.
- *Control of the telescope* through your personal computer. (Requires optional #505 Connector Cable Set.)
- *Fast alignment of the telescope* in either equatorial or altazimuth modes using any of three alignment functions, including the Meade-proprietary Easy Align*.
- *Unlike the hand controllers* included with competing 5" and 8" SCT's, *Autostar is fully upgradeable over the Internet*: the observer can add the positions of new comets, update the positions of Earth satellites, even add new software as it becomes available.

Cordless Operation: The LX 90 is powered at 12 volts DC provided by (user-supplied) C-cell batteries. Alternately, the telescope may be powered from an automobile cigarette lighter plug or from a standard 115vAC home outlet, using optionally available power cords.

* Patent pending.

Meade 8" LX90 Schmidt-Cassegrain Telescope. Complete as shown:

$1695

SPECIFICATIONS: 8" LX90 — Each complete telescope includes 8" f/10 Schmidt-Cassegrain optical tube assembly with EMC super multi-coatings; double-tine fork mount with dual-axis 4.9" worm gears and control panel; electric slow-motion controls on both axes; Autostar hand controller with digital readout display, 9-speed drive controls on both axes, and GO TO controller; 30,223-object onboard celestial software library; internal battery port accepts 8 (user-supplied) C-cells (optional 25 ft. cords permit powering from either 12vDC auto cigarette lighter plug or from 115vAC home outlet); 8 x 50mm viewfinder; 1.25" diagonal prism; Series 4000 Super Plössl 26mm eyepiece; standard field tripod; operating instructions. **$1695.** Packing & shipping in the 48 states: $95.

AUTHORIZED MAIL-ORDER DEALERS

ASTRONOMICS, Norman, OK.
Orders: 800-422-7876; Info.: 405-364-0858.

FOCUS CAMERA, Brooklyn, NY.
Orders: 800-221-0828; Info.: 718-436-6262.

LUMICON, Livermore, CA.
Orders: 800-767-9576; Info.: 925-447-9570.

OCEANSIDE PHOTO & TELESCOPE, Oceanside, CA.
Orders & Information: 800-483-6287.

POCONO MOUNTAIN OPTICS, Moscow, PA.
Orders: 800-569-4323; Info.: 570-842-1500.

RIVERS CAMERA, Dover, NH.
Orders: 800-245-7963; Info.: 603-742-4888.

SHUTAN CAMERA & VIDEO, Chicago, IL.
Orders & Info.: 800-621-2248; IL: 847-367-4600.

EFSTONSCIENCE, Toronto, Ontario, Canada
Orders & Information: 416-787-4581.

KHAN SCOPE CENTRE, Toronto, Ontario, Canada
Orders & Information: 416-783-4140.

MEADE
LX200
MEADE LX200 EMC
Meade

The largest-selling serious telescopes in the world are now available at the most affordable prices *ever!*

With their large object databases, fast slewing speeds, and uncanny pointing precision, Meade LX200's are recommended for those amateurs who intend an extensive program of CCD imaging, astrophotography, or deep-space observing. Compare a Meade LX200 feature-for-feature with competing single-tine-fork, spur-gear-driven, GO TO Schmidt-Cassegrains:

Superb Optics: With oversize primary mirrors for greater full-field illumination, LX200 diffraction-limited imaging capabilities are a legend in the industry; we regularly receive reports stating that optical performance approaches that of a fine *ED* apochromatic lens.

Automatic GO TO Capability: Competing 8" Schmidt-Cassegrains claim to place objects "somewhere in the field of view"; Meade LX200's place objects **dead-center** in the field of view, first time, every time, to a pointing precision of **2 arc-minutes or better,** or, with Meade exclusive High Precision Pointing, to a precision of **one arc-minute or better.** *Meade LX200's are the only commercial telescopes ever manufactured that automatically GO TO any input R.A. and Dec., or to any object in the onboard database, to these levels of precision.*

Database of 64,359 Objects, a database *more than three times larger* than competing GO TO telescopes.

Permanently-Programmable Smart Drive™ routinely achieves 5 arc-sec. periodic error, an observatory standard. Other brands of GO TO 8" SCT's decline to state their periodic error and do not offer any programmable error-corrector.

9-Speed Dual-Axis Electronics: Electronics that cover every contingency of telescope positioning — from 2x photo-guide, to 32x image centering, to 8°/sec. slewing across the sky, plus 6 other dual-axis drive speeds in between.

Rigid LX200 Dual-Tine Fork Mountings with Dual 5.75" Worm Gears are the choice of advanced observers, CCD imagers, and astrophotographers for their most sensitive applications. Competing spur-gear-driven single-tine forks can not approach the strength, rigidity, and drive-rate precision built into every Meade LX200 mounting.

Full Long-Exposure Capability: Competing 8" GO TO telescopes describe their capability to take short-exposure "planetary and terrestrial photos," without reference to any long-exposure capabilities. Meade LX200's have been the instruments of choice in **thousands** of the most detailed long-exposure images ever taken by amateur astronomers.

Strong Field Tripods: Unlike the thin, extruded aluminum tripods of competing models, every LX200 includes a fully adjustable steel field tripod perfectly suited to the sub-arc-second resolution of the telescope's optics.

SPECIFICATIONS: 7", 8", 10", and 12" LX200's — Each complete telescope includes 8" or 10" (f/6.3 or f/10) or 12" f/10 Schmidt-Cassegrain or 7" f/15 Maksutov-Cassegrain optical tube assembly with EMC super multi-coatings; heavy-duty fork mount with 4" polar ball bearing, dual-axis 5.75" worm gears, and multi-function control panel; manual and electric slow-motion controls on both axes; keypad hand controller with digital readout display, permanently programmable Smart Drive, 9-speed drive controls on both axes (7-speed on 12"), High-Precision Pointing, and GO TO controller; 64,359-object onboard celestial software library; 25 ft. power cord and adapter for telescope operation from 115v.AC (optional #1812 Electronic DC Adapter allows for field powering directly from an automobile cigarette lighter plug); 8 x 50mm viewfinder; 1.25" diagonal prism (7", 8", 10") or 2" diagonal mirror with 1.25" adapter (12"); Series 4000 Super Plössl 26mm eyepiece; standard field tripod (7", 8", 10") or giant field tripod (12"); operating instructions.

8" LX200 Schmidt-Cassegrain	**$2295**
10" LX200 Schmidt-Cassegrain	**2695**
12" LX200 Schmidt-Cassegrain	**3995**
7" LX200 Maksutov-Cassegrain	**2795**

Packing and shipping in the 48 states: 8"—$105; 10"—$145; 12"—$215; 7"—$125.

Prices shown are suggested U.S. mail-order retail prices.

Meade 8" LX200 Schmidt-Cassegrain Telescope. Complete as shown:

$2295

New 2000-2001 126-page Meade General Catalog!

Call, write or fax for your free copy.

ADVANCED PRODUCTS DIVISION

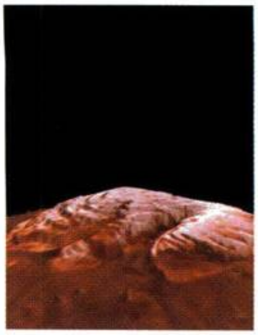
Meade Instruments Corporation

World's Leading Manufacturer of Astronomical Telescopes for the Serious Amateur

6001 Oak Canyon, Irvine, California 92618 ■ (949) 451-1450
FAX: (949) 451-1460 ■ *www.meade.com*

© 2000

December 2000 • Vol. 28, No. 12



Astronomy®

COVER PHOTO: NASA

FEATURES

COVER

37 **Into Another Dimension**
Strap on your 3-D glasses and watch the solar system and the deep sky come to life as we present three stories filled with wondrous three-dimensional images.

38 **Back to Mars**
The Mars Pathfinder mission may have shut down in 1997, but scientists continue to pore over the images and data returned from a martian flood plain. *Robert Naeye*

44 **Seeing the Depths of the Universe**
Distant galaxies, glowing nebulae, glittering star clusters, and more highlight Akira Inaka's impressive gallery of astrophotos. *Kelly Kizer Whitt*

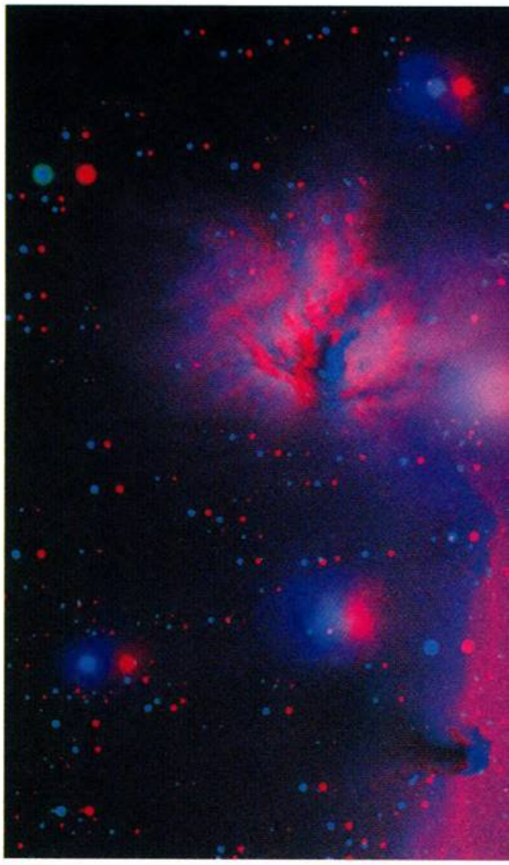
50 **Earth Is a Planet, Too**
NASA's Shuttle Radar Topography Mission returned 270 megabytes of data every second, letting scientists create topographic maps of 80 percent of Earth's landmass. *Dave Eicher*

56 **Space Junk**
Even a particle of dust packs a wallop when it hits at 22,000 miles per hour. And with 5,500 tons of man-made objects in Earth orbit, collisions will occur. *Robert Coontz Jr.*

76 **Stars Shine over Tinseltown**
The greater Los Angeles area boasts Griffith Observatory, Mt. Wilson, the Jet Propulsion Laboratory, and — surprise — some of the best skies in North America. *Patricia Kurtz*

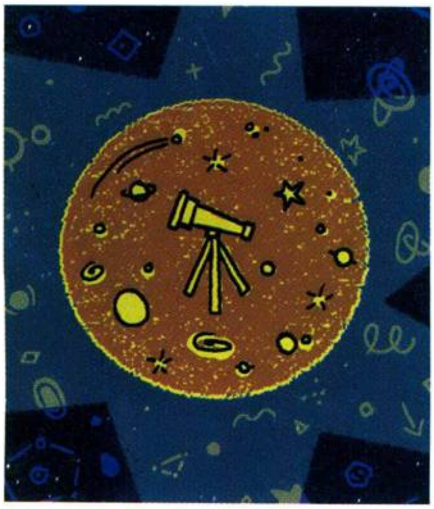
37 3-D Universe

NASA



44 Depths of the Universe

Akira Inaka

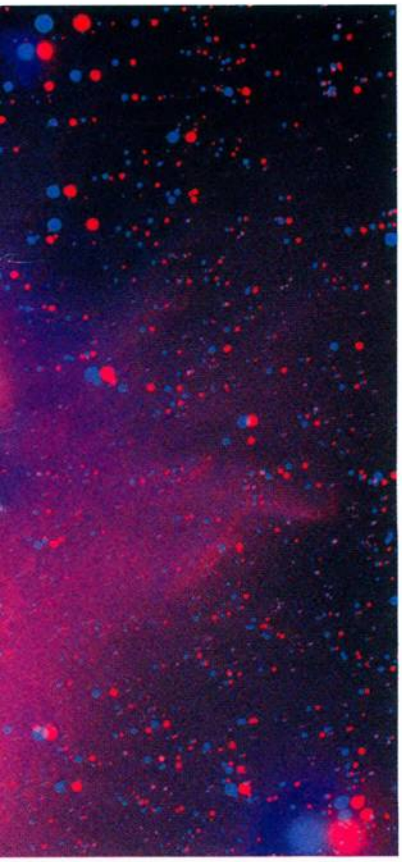


86 Ask Astro

Astronomy: Terri Field

38 Back to Mars

NASA/JPL/Tim Hunter



DEPARTMENTS

6 Behind the Scenes
- America's Best-Selling Astronomy Magazine

14 Talking Back

24 AstroNews
- Census Shows Brown Dwarfs Numerous
- Europa's Slushy Subsurface
- Black Holes in All Sizes
- First Light for Radio Telescope
- Loneliness of a Neutron Star
- Holes Dig Deep into Jupiter's Atmosphere

64 Sky Show
- North Americans witness a partial eclipse of the sun while everyone sees the moon pass Venus, Jupiter, and Saturn. *Martin Ratcliffe and Alister Ling*

86 Ask Astro

92 Strange Universe

96 Star Stuff

Products
- Tasco StarGuide
- Green Laser Pointer
- More . . . Universe at Your Fingertips
- *Astronomy* Magazine 2001 Calendar
- Star Gazer

Books
- *The Book of the Cosmos: Imagining the Universe from Heraclitus to Hawking*
- *Voodoo Science: The Road from Foolishness to Fraud*
- *Cosmic Dispatches:* The New York Times *Reports on Astronomy and Cosmology*

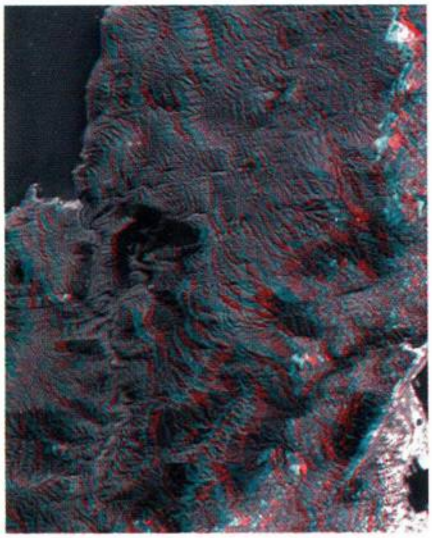
116 Looking Ahead

121 Advertiser Index

122 Hot Shots
- Following the Moon

128 Ultimate Exposure

50 Watching Earth from Space NASA



56 Space Debris

NASA

76 An Astronomer's Tour of Tinseltown Raleigh Souther

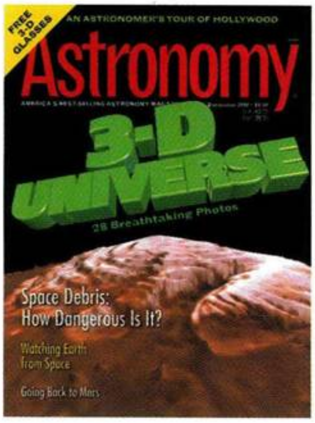
BEHIND THE SCENES

BY BONNIE BILYEU GORDON

America's Best-Selling Astronomy Magazine

Four years ago, shortly after I joined the staff of *Astronomy* magazine, a man approached our booth at a star party to ask me about our circulation. When I responded, he expressed dismay. He couldn't believe we were the world's biggest astronomy magazine written in English. He said he thought we were smaller than one of our competitors because it had been around so much longer, but he was dead wrong. We are America's best-selling astronomy magazine and we have been for more than 20 years. We outgrew all the competition only seven years after founding editor Steve Walther launched the publication. (There is a Japanese astronomy magazine that enjoys an audience about 10,000 larger than ours.)

I'm proud to be carrying the magazine in a direction Steve would have wanted. His goal was to provide the most beautiful astronomy magazine in the world. I believe we do. But I'm equally proud of the magazine's presentation of information that is more ambitious now than it has ever been. Because we grew like Topsy, it's been possible to attract and hire knowledgeable, elegant writers and editors to fill our pages with the best astronomy news and information. It's been possible to energize our pages with great photos and design and to present special issues that include 3-D images. (Save those glasses for future use.) Anyone can make a claim like those I'm making here, but no other astronomy magazine can back theirs up with numbers.


FREE 3-D GLASSES
AN ASTRONOMER'S TOUR OF HOLLYWOOD
Astronomy
3-D UNIVERSE
28 Breathtaking Photos
Space Debris: How Dangerous Is It?
Watching Earth from Space
Going Back to Mars

It's gravy to add one more note: We have more readers who are advanced amateurs, more who are intermediate amateurs, and more who are beginners than any other English-language astronomy magazine. This information comes from professional surveyors hired by most magazines to find out exactly who their audiences include. Ours includes you. And we thank you for choosing us.

So, if you were wondering why we added the slogan "America's Best-Selling Astronomy Magazine" to our cover in November, this is why: We wanted to counteract a mistaken perception about our ranking among astronomy publications. We were tired of saying it over and over.

Astronomy®

EDITORIAL STAFF

EDITOR
Bonnie Bilyeu Gordon
MANAGING EDITOR
David J. Eicher
SENIOR EDITOR
Rex Graham
ASSOCIATE EDITORS
Carol Ryback, William Schomaker, Richard Talcott
COPY AND PHOTO EDITOR
Kelly Kizer Whitt
EDITORIAL ASSOCIATE
Terry Williams Conley
EDITORIAL ASSISTANT
Julie Sherwin
CONTRIBUTING EDITORS
Robert Irion, Ray Jayawardhana, Patricia Kurtz, Beth Livermore, John Shibley, Tom Yulsman

ART STAFF

ART DIRECTOR
Carole Ross
ASSISTANT ART DIRECTOR
Thomas Ford
GRAPHIC ARTIST
Beth Wesselhoff
ILLUSTRATOR
Elisabeth Rowan
PRODUCTION COORDINATOR
Helene Tsigistras

EDITORIAL ADVISORY BOARD

Buzz Aldrin, Marcia Bartusiak, K.C. Cole, Timothy Ferris, Adam Frank, Paul Hodge, John S. Gallagher III, Anne L. Kinney, Edward Kolb, Alan Lightman, Stephen P. Maran, Boyce Rensberger, James Trefil

ASTRONOMY.COM EDITOR

Andrea Gianopoulos

Astronomy HOME PAGE
http://www.astronomy.com

ASTRONOMY (ISSN 0091-6358, USPS 531-350) is published monthly by Kalmbach Publishing Co., 21027 Crossroads Circle, P.O. Box 1612, Waukesha, WI 53187. Editorial phone: (262) 796-8776; advertising: (888) 558-1544; customer service & sales: 800-533-6644; outside the U.S. and Canada: 262-796-8776, ext. 421, Monday through Friday, 8:30 A.M. to 5 P.M. CT, Fax: (262) 796-1615; E-mail: customerservice@kalmbach.com. Please include your name, mailing address, and telephone number with any correspondence. Copyright © 2000 Kalmbach Publishing Co., all rights reserved. Material in this publication may not be reproduced in any form without permission. Periodicals postage paid at Waukesha, WI, and additional offices. Printed in the U.S.A. Allow 6 to 8 weeks for new subscriptions and address changes. Subscription rate: single copy: $4.50; 1 year $39.95, 2 years (24 issues) $74.95, 3 years (36 issues) $106.95; Canadian & foreign: 1 year $50, 2 years $95, 3 years $137. Payable in U.S. funds drawn on U.S. Banks. (Canadian price includes GST.) Expedited Delivery Service Surcharges: Domestic 1st Class $30 per year, Canadian air $30 per year, Foreign air, $60 per year. BN 12271 3209 RT. Canada Post Publication Agreement Number 545-775. Not responsible for unsolicited materials. POSTMASTER: Send address changes to ASTRONOMY, 21027 Crossroads Circle, P.O. Box 1612, Waukesha, WI 53187-1612.

8" LX10
8" LX10 DELUXE

The optical performance of a Meade 8" LX200 Schmidt-Cassegrain...for only *$995!*

8" LX10: For the serious amateur astronomer on a more limited budget, or for the more casual observer who nonetheless demands the very finest in optical performance, the Meade 8" LX10 satisfies every requirement. *Standard-equipment includes:*

Super-Multi-Coated Optical System: The *exact same* multi-coated 8" Schmidt-Cassegrain optical tube assembly as the more expensive Meade 8" LX200. **Series 4000 SP26mm eyepiece:** Complements the exquisite imaging of Meade 8" SC optics. **Equatorial Fork Mounting:** The relatively light weight, but very stable, LX10 fork mounting provides all of the rigidity required for sensitive high-power applications of the telescope, or for photographic or CCD imaging. **Cordless, DC-Powered Electronic Motor Drive:** With electronically-regulated DC servo motor for automatic *sidereal-rate* tracking; powered by four AA-size batteries that fit conveniently into the telescope's control panel; battery life is in excess of 50 hours. **Worm-Gear System:** The LX10's 5.75"-diameter worm gear produces extremely smooth, regular motion in R.A., with low periodic error — a periodic error that permits such advanced capabilities as long-exposure astrophotography or CCD imaging. **Hand Controller:** Essential for micro-guiding the telescope during long-exposure astrophotography, the LX10's pushbutton hand controller enables precise corrections in R.A. at 2x speed. With the optional electric Declination motor added to the telescope, the hand controller is functional at 2x speeds on both telescope axes.

SPECIFICATIONS: 8" Model LX10 — Includes 8" Schmidt-Cassegrain optical tube assembly with EMC super multi-coatings (D = 203mm; F = 2000mm, f/10); fork mount with setting circles, manual slow-motion controls, and locks on both axes; 5.75" LX worm gear reduction system; sidereal-rate electronically-regulated DC servo motor drive; 4-pushbutton hand controller for 2x speed corrections in R.A.; battery compartment accepting four (user-supplied) AA-size batteries (telescope may also be powered from an auto cigarette lighter plug, using optional 25 ft. cord); 6 x 30mm viewfinder; eyepiece-holder and diagonal prism (1.25"); SP26mm multi-coated eyepiece; standard equatorial wedge with elevation scale, fine elevation control, and 360° azimuth orientation capability; complete operating instructions. **$995.** (+ $65 packing & shipping in the 48 states)

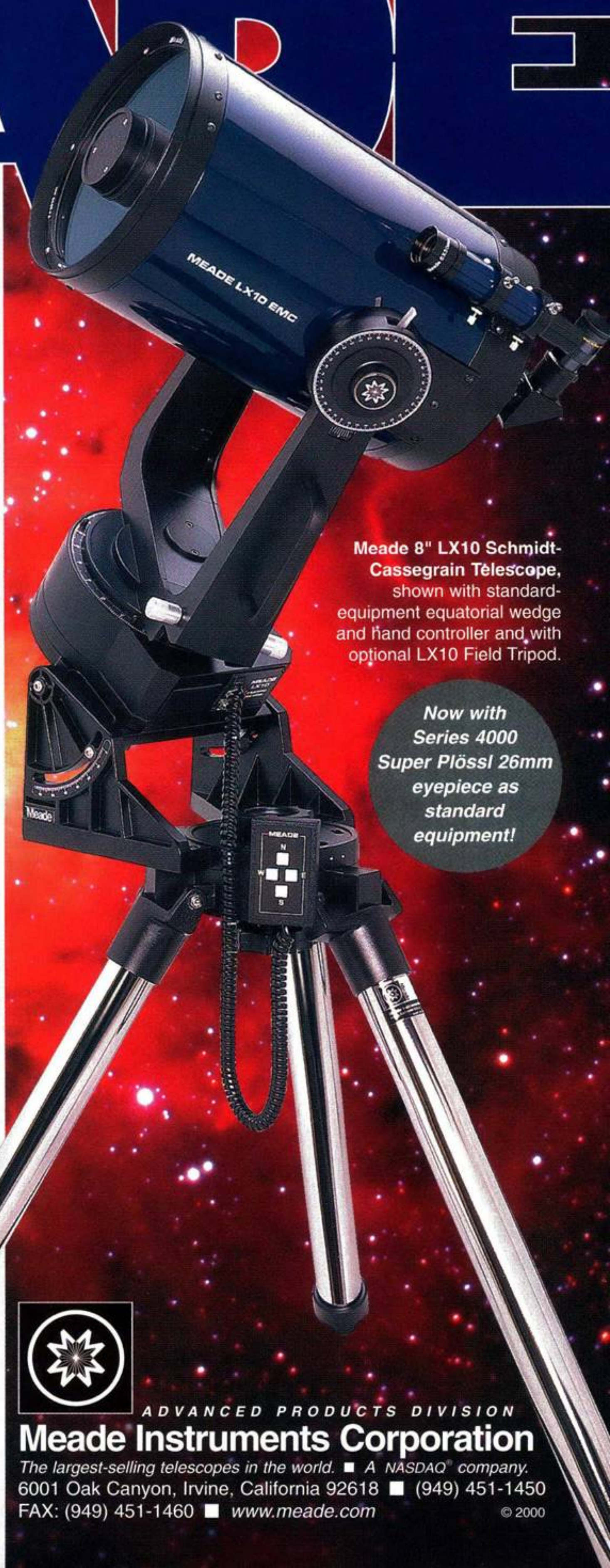
8" LX10 Deluxe: At only $1149 the 8" LX10 Deluxe includes (a) the large-aperture Meade #544 8 x 50mm viewfinder (in place of the standard 6 x 30mm finder); (b) the LX10 Electric Declination Motor System, permitting dual-axis guiding corrections at 2x speed; and (c) Meade Epoch 2000 Jr. Sky Software with 10,000-object database — all at substantially lower cost than if the respective accessories were purchased separately.

SPECIFICATIONS: 8" Model LX10 Deluxe — Identical in all specifications to 8" Model LX10, above, but with Electric Declination Motor System provided as standard equipment, permitting dual-axis corrections at 2x speed; Meade #544 8 x 50mm achromatic viewfinder in place of 6 x 30mm viewfinder; and Meade Epoch 2000 Jr. Sky Software with 10,000-object database.

$1149. (+ $65 packing & shipping in the 48 states)

Field Tripod for LX10 or LX10 Deluxe	**195.**
Electric Declination Motor System for LX10.....	**95.**
#2014 Magellan I Telescope Computer System for LX10 or LX10 Deluxe, with 12,218-object database	**375.**

Prices shown are suggested U.S. mail-order prices.
© 2000



Meade 8" LX10 Schmidt-Cassegrain Telescope, shown with standard-equipment equatorial wedge and hand controller and with optional LX10 Field Tripod.

Now with Series 4000 Super Plössl 26mm eyepiece as standard equipment!

ADVANCED PRODUCTS DIVISION
Meade Instruments Corporation
The largest-selling telescopes in the world. ■ *A NASDAQ® company.*
6001 Oak Canyon, Irvine, California 92618 ■ (949) 451-1450
FAX: (949) 451-1460 ■ *www.meade.com*

© 2000

New!

Now you can join the ETX revolution for as little as $299, complete!

MEADE ETX-60AT · ETX-70AT

Let Meade high-resolution ETX optics and standard-equipment Autostar controller take you on an automated guided tour of the Solar System, the Galaxy, and beyond. Now even the most novice amateur astronomer can locate and explore the planets, asteroids, and comets, as well as nebulae, star clusters, galaxies, and hundreds of other deep-space objects, at the push of a button.

Fork Mount with Dual-Axis Drive System: In conjunction with the Autostar hand controller, precision worm gear systems on each axis permit smooth pushbutton motions of the telescope, as well as sidereal-rate tracking in the altazimuth mode.

Standard-Equipment #494 Autostar™ Controller: The #494 Autostar includes most of the same features as the more advanced #497 Autostar available for larger Meade ETX models *(facing page)*.

- **Automatic dual-axis GO TO function at 4.5°/sec.** to any of more than 1450 database objects, including the complete Messier and Caldwell deep-space object catalogs, the major planets from Mercury to Neptune, 26 asteroids, 15 periodic comets, and more.
- **Select any of Autostar's** database objects, or any object of known R.A. and Dec, press ***GO TO*** and the telescope automatically slews to the object, placing it in the telescopic field of view.
- **Digital readouts** of telescope position, continuously in R.A. and Dec.
- **9-speed Dual-Axis Operation:** Pushbutton control of the telescope on both axes, simultaneously, at any speed from 2x sidereal to 4.5°/sec., plus sidereal-rate tracking.

High-Resolution Achromatic Objective Lenses: ETX 60mm and 70mm models include multi-coated, air-spaced achromatic lenses of exclusive Meade design; each lens yields razor-sharp images of astronomical and terrestrial subjects.

Flip-Mirror System: Flip the internal optical flat mirror "up" for 90° observing; flip the mirror "down" for terrestrial observing with the optional #933 45° Erecting Prism or for photography with the optional #64ST Photo Adapter.

Cordless Operation: The dual-axis drive of Meade ETX-60AT and ETX-70AT models operates for over 20 hours in the field from six AA-size (user-supplied) batteries which store neatly inside the drive base.

Solar System: Saturn
ENTER
MODE
GO TO
SPEED
MEADE
AUTOSTAR
Guided Tour
Tonight's Best
ENTER
MODE
GO TO
SPEED
MEADE
AUTOSTAR
MEADE
COMPUTER CONTROL

ETX-70AT: $349, complete with #494 Autostar Controller

ETX-60AT: $299, complete with #494 Autostar Controller

SPECIFICATIONS: ETX-60AT and ETX-70AT Astro Telescopes — Each includes achromatic refractor optical tube assembly (D = 60mm, F = 350mm, f/5.8 *or* D = 70mm, F = 350mm, f/5) with multi-layer optical coatings; internal flip-mirror system for either straight-through or 90° observing position; fork mount with electric slow-motion controls, setting circles, and locks on both axes; electronic control panel; 9-speed (2x sidereal through 4.5°/sec.) dual-axis motor drive system with #494 Autostar computer controller; sidereal-rate tracking; internal battery compartment accepting six (user-supplied) AA-size batteries; MA9mm (39X) and MA25mm (14X) multi-coated eyepieces; operating instructions. **ETX-60AT — $299** (+$10 packing & shipping in the 48 states); **ETX-70AT — $349** (+$10 P & S).

OPTIONAL SYSTEMS FOR MEADE ETX TELESCOPES*

#882 Standard Field Tripod (60, 70)	$99.00	#883 Deluxe Field Tripod (90, 125)	199.95
#827 8 x 25mm Right-Angle Viewfinder (60, 70)	49.95	#825 8 x 25mm Right-Angle Viewfinder (90)	49.95
#773 Hard Carry Case (60, 70)	59.95	#774 Hard Carry Case (90)	99.95
#933 45° Erecting Prism (60, 70)	49.95	#775 Hard Carry Case (125)	149.95
#64ST Photo Adapter (60, 70)	19.95	#932 45° Erecting Prism (90, 125)	49.95
#497 Autostar Computer Controller (90, 125)	149.00	#64 Photo Adapter (90, 125)	34.95
#880 Equatorial Table Tripod (90)	29.95	Electric Focuser #1244 (90) *or* #1247 (125)	119.95
#881 Equatorial Table Tripod (125)	59.95		

**see also the Meade accessory ad in this issue.*

MEADE INSTRUMENTS CORPORATION *The largest-selling telescopes in the world.*

MEADE
ETX-90EC · ETX-125EC
COMPUTER CONTROL
FOCUS
SPEED
MODE
MEADE

ETX-90EC:
$595, complete
with Electronic
Controller

ETX-125EC:
$895,
complete with
Electronic
Controller

Two advanced apertures:
ETX-90EC — $595
ETX-125EC — $895

Meade® 3.5" and 5" ETX® models include the very latest in microprocessor-controlled capability:

Fork Mount with Dual-Axis Drive System: Each with high-torque DC motors on both telescope axes, permitting electronic operation from the standard-equipment plug-in hand controller.

Pushbutton Electronic Hand Controller: Use at any of four dual-axis speeds: 8x for image centering at high power; 32x for image centering at lower power or for pushbutton object-tracking in the altazimuth mode; 0.75°/sec for image centering in the viewfinder or for terrestrial tracking; 5°/sec for fast slewing across the sky.

Maksutov-Cassegrain Optical Systems: Manufactured at the Meade Irvine, facility, ETX diffraction-limited optics produce images so high in contrast and resolution that ETX telescopes often outperform other telescopes of larger apertures.

Flip-Mirror System: Flip the internal optical flat mirror "up" for 90° observing; flip the mirror "down" for terrestrial observing with the optional #932 45° Erecting Prism or for photography with the optional #64 Photo Adapter.

Cordless Operation: The dual-axis drive system operates for more than 40 hours from eight (user-supplied) AA batteries which store neatly inside the drive base.

Optional #497 Autostar™ Capability: Plug in the optional Meade #497 Autostar computer controller for LX200-type operation, including:

- **Automatic dual-axis GO TO function at 5°/sec** to any of more than 14,000 database objects, including deep-space objects (galaxies, diffuse nebulae, planetary nebulae, star clusters); the 8 major planets from Mercury to Pluto; 26 of the brightest asteroids; 15 periodic comets; and more.
- Select any of Autostar's database objects, or any object of known R.A. and Dec, press ***GO TO*** and the telescope automatically slews to the object, placing it in the telescopic field.
- **Digital readouts** of telescope position, continuously in R.A. and Dec.
- **9-Speed Dual-Axis Operation:** Pushbutton control of the telescope on both axes, simultaneously, at any speed from 2x sidereal to 5°/sec., plus sidereal-rate tracking.

ETX AUTOSTAR
RA = 08:04.6
Dec = +36°38'
MEADE
ENTER
MODE
GO TO

SPECIFICATIONS: ETX 90EC and ETX-125EC Astro Telescopes — Each includes Maksutov-Cassegrain optical tube assembly (D = 90mm, F = 1250mm, f/13.8 *or* D = 127mm, F = 1900mm, f/15) with EMC super multi-coatings; internal flip-mirror system for either straight-through or 90° observing position; fork mount with electric slow-motion controls, setting circles and locks on both axes; electronic control panel; 4-speed (8x, 32x, 0.75°/sec, 5°/sec) dual-axis motor drive system with hand controller; sidereal-rate tracking in equatorial mode with optional table tripod or deluxe field tripod; internal battery compartment accepting eight (user-supplied) AA-size batteries; 8 x 21mm erect-image (ETX-90EC) *or* 8 x 25mm right-angle (ETX-125EC) viewfinder; Series 4000 Super Plössl 26mm eyepiece (1.25"); instructions. **ETX-90EC — $595** (+ $20 packing & shipping in the 48 states); **ETX-125EC — $895** (+ $30 P & S).

AUTHORIZED U.S. AND CANADA MAIL-ORDER DEALERS

ASTRONOMICS, Norman, OK.
Orders: 800-422-7876; Info.: 405-364-0858.

FOCUS CAMERA, Brooklyn, NY.
Orders: 800-221-0828; Info.: 718-436-6262.

LUMICON, Livermore, CA.
Orders: 800-767-9576; Info.: 925-447-9570.

OCEANSIDE PHOTO & TELESCOPE, Oceanside, CA.
Orders & Information: 800-483-6287.

POCONO MOUNTAIN OPTICS, Moscow, PA.
Orders: 800-569-4323; Info.: 570-842-1500.

RIVERS CAMERA, Dover, NH.
Orders: 800-245-7963; Info.: 603-742-4888.

SHUTAN CAMERA & VIDEO, Chicago, IL.
Orders & Info.: 800-621-2248; IL: 847-367-4600.

KHAN SCOPE CENTRE, Toronto, Ontario.
Orders & Information: 416-783-4140.

6001 Oak Canyon, Irvine, CA 92618. (949) 451-1450. FAX: (949) 451-1460. www.meade.com

© 2000

MEADE STARFINDER™ EQUATORIAL NEWTONIANS

Meade® Starfinder 8" Equatorial with Motor Drive... *now only* *$599!*

Complete with giant rack-and-pinion focuser for 1.25" and 2" eyepieces, 6 x 30mm viewfinder, Super Plössl 26mm eyepiece, and premium-grade Pyrex® optical system.

Precision, heavy-duty equatorial mount with DC-powered drive system for fully automatic tracking.

Shown with optional #2011 Magellan I Computer System.

Professional-Grade Optical System: Hand-figured, parabolic primary mirror and elliptical flat secondary, both of Grade-A Pyrex glass. Optics are multi-coated and meet the theoretical limits of resolution.

Accessories and Components: Premium-grade multi-coated SP26mm eyepiece (1.25"); 6 x 30mm viewfinder with wide 7° field; strong, durable, spiral-wound optical tube with attractive white finish.

Precision Equatorial Mount: Manufactured of machined aluminum to tolerances of .001" or better, with 4"-dia. pier and die-cast tripod legs for rock-solid support of the optical tube. Moves effortlessly from object to object on precision bearing surfaces. Polar and Dec. shafts are 1" solid steel. Setting circles on both axes.

Battery-Powered Cordless Drive System: For fully automatic tracking of celestial objects. Operates over 50 hours from 6 (user-supplied) AA-batteries or from 12v. auto cigarette lighter plug, using optional 25 ft. cord.

2" Giant Focuser: Meade #77 giant rack-and-pinion focuser is included as standard equipment, with eyepiece-holders for both 1.25" and 2" eyepieces.

Starfinder Equatorial 16: Includes equatorial mounting with 1.5" steel shafts, Sealmaster ball bearings, 6" dia. pier, and 6 x AA-size battery-powered worm gear drive; 8 x 50mm viewfinder; #77 giant focuser.

Magellan I Telescope Computer System: Use the Magellan I computer to manually slew the telescope quickly to any of 12,218 database objects, or to any object of known R.A. and Dec. Specifications and object database are identical to Magellan I for Starfinder Dobsonians *(see facing page).*

#2011: for Meade Starfinder Equatorial 6", 8", or 10" . . . . . $295.
#2012: for Meade Starfinder Equatorial 16". . . . . 295.

Magellan II Computer-Corrector: Plug the Magellan II into the control panel of your Meade Starfinder Equatorial and you have all the capabilities of the Magellan I, above, including 12,218-object database, *plus* a 4-speed (2x, 8x, 16x, 32x), dual-axis, drive corrector/microslewing system.

#2018: for Starfinder Equatorial 6", 8", 10" . . . . 495.
#2019: for Starfinder Equatorial 16" . . . . 595.

Packing & shipping in the 48 states: Magellan I – $15, Magellan II – $20.

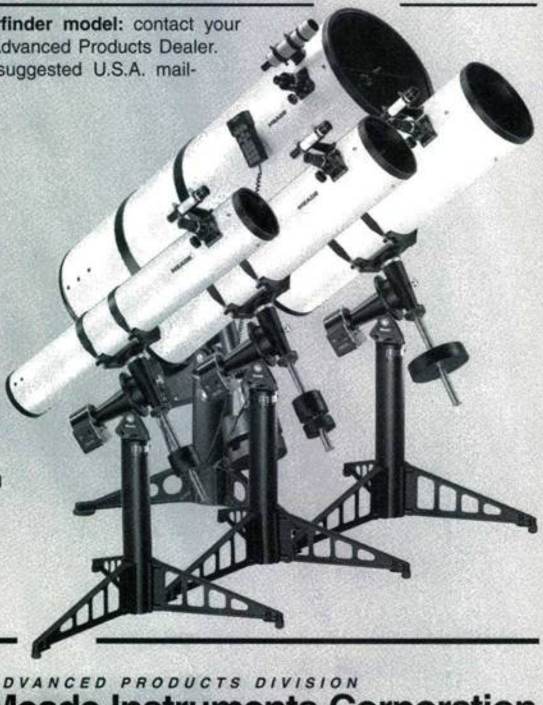
Special Eyepiece Offer! At the time you order any Meade Starfinder Equatorial telescope, you can buy a Meade Series 4000 Super Plössl 9.7mm eyepiece ***for only $29.95!*** *Purchased separately, the SP9.7mm eyepiece sells for $79.95.*

Meade Starfinder Equatorial Telescopes

6" f/8	**$499**	**10" f/4.5**	**699**
8" f/6	**599**	**16" f/4.5**	**2695**

Packing & UPS Shipping Charges to any address in the 48 states: 6"—$65; 8"—$75; 10"—$90; 16"—$55 packing, shipped truck freight collect.

To Order any Starfinder model: contact your authorized Meade Advanced Products Dealer. Prices shown are suggested U.S.A. mail-order retail prices.



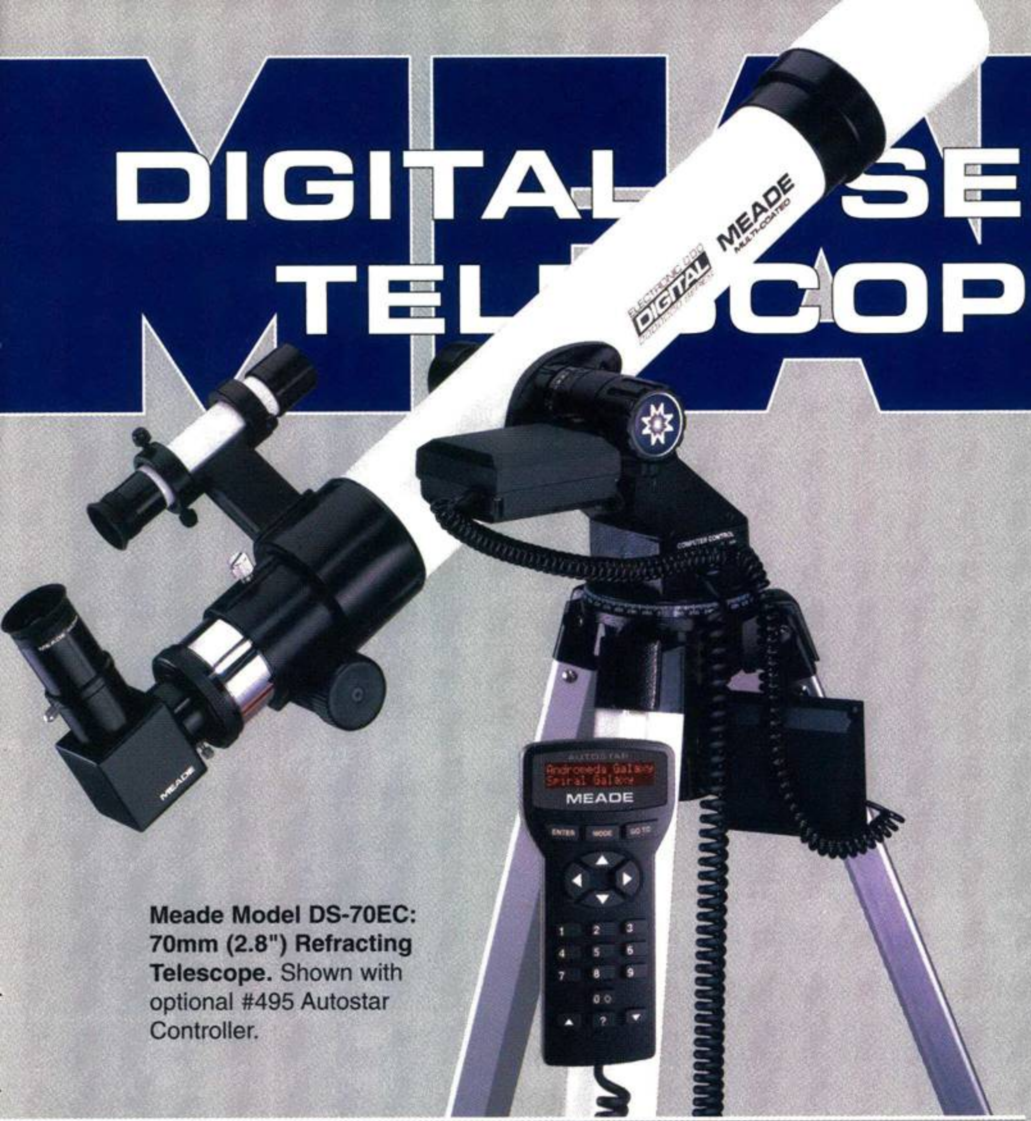
New 120-page 2000 Meade General Catalog!

Write, call, or fax Meade Instruments for your free copy.

ADVANCED PRODUCTS DIVISION
Meade Instruments Corporation
The largest-selling telescopes in the world. ☐ *A NASDAQ company.*
6001 Oak Canyon, Irvine, California 92618 ☐ (949) 451-1450
FAX: (949) 451-1460 ☐ *www.meade.com*

© 2000

DIGITAL SERIES TELESCOPES



Meade Model DS-70EC: 70mm (2.8") Refracting Telescope. Shown with optional #495 Autostar Controller.

Meade Digital Series (DS) Telescopes offer the widest range of features ever made available in telescopes of their price class. The standard-equipment Electronic Controller (EC) permits precise pushbutton slewing and tracking at any of four speeds. Available optionally, the #495 Autostar Controller allows for automatic GO TO operation.

Digital Electronic Series Telescopes by Meade®: High Technology, Low Prices.

Now even the beginning or casual observer can enjoy the benefits of the very latest in digital microprocessor technology. Meade Digital Series (DS) telescopes are a revelation of electronic capability, premium-grade optics, and mechanical precision.

Electronic Controller: Use the Electronic Controller, provided as standard equipment with all DS-EC models, at any of four dual-axis speeds from 2 arcmins/second to 6°/second, to center and track astronomical objects at any magnifying power.

Altazimuth Mountings: Engineered for smooth dual-axis tracking, Digital Series altazimuth mounts provide a level of mechanical precision previously unavailable on beginning- and intermediate-aperture telescopes.

Optical Systems: Meade DS refracting telescope models include 2-element mulit-coated achromatic objective lenses, precision polished from crown and flint optical glass components. Newtonian reflecting telescopes of the series include primary and secondary mirrors free of the optical zones and irregularities often found on optics of lesser quality.

Optional #495 Autostar Controller: Plug in the Meade #495 Autostar Controller to the control panel of your DS-EC telescope, and you're ready to locate any of over 1500 celestial objects in the Autostar database, including hundreds of galaxies, nebulae, star clusters, the complete Messier and Caldwell deep-space catalogs, and more — all at the push of the GO TO button.

IN
FOCUS
OUT
SPEED
MODE
MEADE

The standard-equipment Electronic Controller of Meade DS-EC models.

Specifications: Each Meade Digital Series telescope described here is *supplied complete* as shown in the photo below, with aluminum field tripod, two eyepieces (1.25"), diagonal mirror, 5 x 24mm or 6 x 30mm finder, Electronic Controller with dual-axis motors, and battery pack (accepts ten AA-size user-supplied batteries.) *See the Meade General Catalog for complete specifications.*

MEADE DIGITAL SERIES TELESCOPES

DS-60EC: 60mm (2.4") Refractor	$299
DS-70EC: 70mm (2.8") Refractor	349
DS-80EC: 80mm (3.1") Refractor	449
DS-90EC: 90mm (3.5") Refractor	499
DS-114EC: 114mm (4.5") Reflector	399
DS-127EC: 127mm (5.0") Reflector	449
#495 Autostar for any above model	99

Prices shown are suggested U.S. mail-order retail prices. Patents pending on DS systems architecture and Autostar.

ADVANCED PRODUCTS DIVISION
Meade Instruments Corporation
The largest-selling telescopes in the world. ☐ *A NASDAQ® company.*
6001 Oak Canyon, Irvine, California 92618 ☐ (949) 451-1450
FAX: (949) 451-1460 ☐ *www.meade.com*

© 2000

Left-to-right: Meade DS-60EC, DS-70EC, DS-80EC, DS-90EC, DS-114EC, DS-127EC

MEADE
RESEARCH-GRADE ACCESSORIES

Series 4000™ Super Plössls
52° field; multi-coated

Meade 4-element Super Plössls, updated and redesigned to utilize the latest in optical glass-types, are the finest general-purpose eyepieces available. For observing hairline lunar and planetary detail, splitting close doubles, or for deep-space; guaranteed to deliver more contrast and image sharpness than any other brand. Rubber eyeguards fold down for eyeglass wearers–a feature not available on competing brands. Multi-coated. All focal lengths through 32mm are parfocal.

Super Plössls (SP; 4-elements; 1.25"; 52°):

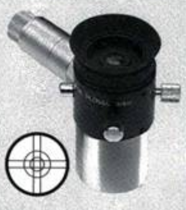
6.4, 9.7, 12.4, 15, 20, 26mm	each:	**$79.95** (4.54)
32mm (52°); **40mm** (44°)	each:	**99.95** (5.26)
56mm (52°; 2")		**199.95** (7.02)

Series 4000™
Ultra Wide Angle
84° field;
multi-coated

The ultimate eyepieces; extreme image sharpness over an amazing 84° field. A perfect optical match with Schmidt-Cassegrains and fast Newtonians.

Ultra Wide Angle (UWA; 8-elements; 1.25"; 84°)– **4.7mm: $169.95** (5.26); **6.7mm: 199.95** (5.26); **8.8mm** (1.25"/2"): **239.95** (7.02); **14mm** (1.25"/2"): **299.95** (7.02)

World's Most Advanced Illuminated Reticle Eyepiece



Series 4000 Plössl 9mm, with rubber eyecup and micrometric X-Y positioning of the reticle within the field. Greatly facilitates locking on the guide star. Sharp high-power imaging, excellent eye relief. Wireless red LED illuminator with adjustable brightness control. Multi-coated optics. **Internal batteries included.** Bullseye reticle. 1.25".

$149.95 (6.14)

Series 4000 Plössl 9mm—Same as above but with 6 ft. cord and plug for Meade LX3, LX5, LX6, LX100, LX200, and APO power panels, in place of wireless illuminator.

$129.95 (5.26)

Series 4000™
f/6.3 Focal Reducer/ Field Flattener

F/6.3 FOCAL REDUCER/FIELD

Manufactured to exclusive Meade optical designs; threads on to any Meade or Celestron Schmidt-Cassegrain rear cell and converts f/10 scopes to f/6.3 (or f/6.3 SCT's to f/4), while significantly flattening the field. Use with SCT visual or photo accessories. Actual visual field is increased by 56%, for fine wide-field views of star fields and nebulae. In astrophotography, reduces exposure times by about 50%, while producing an actual field diameter of 1.5" at the film plane. A tremendous aid with CCD imagers in reducing image size for locating and centering images on CCD chips. 4-element optics; multi-coated; 41mm clear aperture. **$129.95** (5.26)

Series 4000 Photo-Visual Color Filters (1.25")–Premium filters, made of purest crown optical glass, dyed in the mass. For increased contrast and resolution on the Moon and planets. Thread into the barrels of virtually all 1.25" eyepieces sold today. Fully coated.

#8 Lt. Yellow; #11 Yellow Green; #12 Yellow; #21 Orange; #23A Lt. Red; #25A Red; #38A Dark Blue; #47 Violet; #56 Lt. Green; #58 Green; #80A Blue; #82A Lt. Blue each **$14.95** (2.73)

Set #1–4 filters: #12, #23A, #58, #80A	**49.95** (4.54)
Set #2–4 filters: #11, #25A, #47, #82A	**49.95** (4.54)
Set #3–4 filters: #8, #21, #38A, #56	**49.95** (4.54)

Series 4000 Moon Filter (#ND96): Reduces glare and irradiation during lunar observing. 13% uniform light transmission across the visual spectrum. Threads into 1.25" barrels. **$16.95** (2.73)

2x Telenegative Barlow (1.25")

#122: Doubles eyepiece power with sharp, high-resolution, high-contrast imaging on telescopes of all types. 27mm dia. (26mm clear aperture). Excellent corrections for chromatic and spherical aberrations at all photo-visual wavelengths. Multi-coated. 1.25"

$47.95 (4.54)

#905 Variable Polarizer (1.25")

For glare reduction in observing the Moon. Includes two Polarizer filters mounted in a machined cell and permits continuously variable light transmission from 5% to 25%, to compensate for varying lunar surface brightness according to the Moon's phase and the aperture of the telescope. Accepts 1.25" eyepieces. **$49.95** (5.26)

2x Short-Focus Barlow (1.25")

#126: Only 2.5" long, the #126 works well with any telescope accepting 1.25" eyepieces, even those with limited focus range. Maintains the high image quality of the #122, above. Insert the #126 into star diagonal for 2x or insert star diagonal into #126 for 3x. 26mm clear aperture. Multi-coated. **$47.95** (4.54)

Electric Focusers for SCT's

For extremely smooth microfocusing of the image. Does not affect use of the manual coarse-focus knob.

#1206 Electric Focuser: Plugs into control panel of Meade 8", 10", 12" LX200 models and operates from LX200 hand controller. **$149.95** (7.48)

#1205 Electric Focuser: For **all** other Meade 8", 10", 12" SCT models; includes separate hand controller; accepts one self-contained (user-supplied) 9v. battery.

$169.95 (7.88)

2x-3x Variable Barlow (1.25")

#127: Precision internal sliding lens assembly permits continuously variable power settings between 2x and 3x. Engraved scale indicates power in use. Yields bright, sharp, high-contrast images on telescopes of all types. Multi-coated; 1.25".

$59.95 (4.54)

2" Diagonal Mirror

#929: Permits use of wide-field 2" oculars. Threads on to rear cell of Meade and Celestron SCT's. Includes multi-coated precision optical flat made at the Meade factory; with 1.25" eyepiece adapter. **#930:** Same as #929 but with 2" barrel to fit into focusers with 2" eyepiece-holders.

#929 or **#930**, each: **$99.95** (6.85)

#777 Off-Axis Guider for SCT's

Internal prism diverts light for monitoring telescopic image during long-exposure astrophotography. Threads to any Meade or Celestron rear cell. Use with illuminated reticle eyepiece and T-Mount for your 35mm camera.

$79.95 (6.85)

45° Erecting Prisms

Fully coated roof prisms to invert the astronomical image in Schmidt-Cassegrains or refractors during terrestrial observations, while presenting a convenient 45° observing angle. Specify **#927** (.965"), **#928** (1.25"), or **#931** (fits .965" focuser, accepts 1.25" eyepieces).

$42.95 (3.86)

Series 4000™
2x Apochromatic Barlow Lens

#140: The most advanced Barlow lens available for commercial telescopes, the Meade #140 includes 3-element, multi-coated, air-spaced optics. Doubles the power of any eyepiece with which it is used and yields images absolutely unmatched in resolution, contrast and color correction. The #140 optically complements any telescope — refractor, reflector, or Schmidt-Cassegrain. Accepts 1.25" eyepieces. Mechanical components are of machined aluminum and brass. Lens diameter is 28mm; clear aperture 26mm.

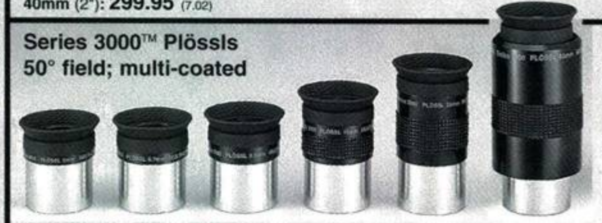
$79.95 (5.26)

Series 4000™
Super Wide Angle
67° field; multi-coated

For exquisite wide-angle images at low-to-medium powers, with pinpoint edge-of-field resolution. Ideal for star fields, galaxies, and other deep-space phenomena. SWA 13.8mm, 18mm, and 24.5mm are superb complements to the #140 Barlow, above.

Super Wide Angle (SWA; 6-elements; 1.25"; 67°)–**13.8mm: $139.95** (4.54); **18mm: 149.95** (4.54); **24.5mm: 179.95** (5.26); **32mm** (2"): **239.95** (7.02); **40mm** (2"): **299.95** (7.02)

Series 3000™ Plössls
50° field; multi-coated



Meade Series 3000 Plössls yield the finest image corrections obtainable from the classical 4-element Plössl design. Focal lengths from 5mm through 25mm are parfocal, so that, at most, only slight refocusing of the image is necessary from eyepiece to eyepiece. Unlike competing moderately-priced Plössls, Meade Series 3000's are **multi-coated** for maximum light transmission and image contrast. Chrome-plated brass barrels are threaded for standard filters. All eyepieces are fitted with fold-down rubber eyecups for comfortable observing. The PL40mm *(far right in photo)*, an excellent complement to any ocular set, produces spectacular low-power, wide fields, ideal for scanning the Milky Way. Manufactured exclusively to Meade optical designs, Series 3000 Plössls yield fine, high-resolution results on reflectors, refractors, and Schmidt-Cassegrains of any focal ratio.

Series 3000 Plössls (4-elements; 1.25"; 50°)

5, 6.7, 9.5, 16, 25mm each: **$49.95** (3.86); **40mm** (44° field): **$79.95** (3.86)

#911B
#910B
#908B
#911N
#910N
#908N

Series 4000 Nebular Filters—Premium multi-layer interference filters, the finest obtainable. Use broadband ("B") filters to block most forms of light pollution; use narrowband ("N") filters in heavily light-polluted areas or for extremely high-contrast observing of faint nebulae.

#908B–Threads into 1.25" eyepieces, 26mm dia.	**79.95** (4.54)
#910B–Threads into 2" eyepieces, 44mm dia.	**119.95** (5.26)
#911B–Threads on to rear cell of Schmidt-Cassegrain telescopes. 36mm dia.	**99.95** (5.26)
#908N–Threads into 1.25" eyepieces, 26mm dia.	**89.95** (4.54)
#910N–Threads into 2" eyepieces, 44mm dia.	**129.95** (5.26)
#911N–Threads on to rear cell of Schmidt-Cassegrain telescopes. 36mm dia.	**119.95** (5.26)

#911X
#910X
#908X

Series 4000 Oxygen-III Filters Observe diffuse emission and planetary nebulae as you never thought possible! Exclusive Meade *60-layer* interference coating technology isolates the 496nm and 501nm O-III lines to tremendously enhance observable nebular structural detail in all telescopes.

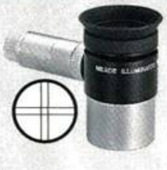
#908X–Threads into 1.25" eyepieces, 26mm dia.	**99.95** (4.54)
#910X–Threads into 2" eyepieces, 44mm dia.	**159.95** (5.26)
#911X–Threads on to rear cell of Schmidt-Cassegrain telescopes. 36mm dia.	**149.95** (5.26)

Modified Achromatic Eyepieces

Meade 3-element MA eyepieces yield sharp, well-corrected images on the Moon, planets, and deep-space at a reasonable price. Multi-coated; threaded for filters; 1.25" barrel diameter. Apparent field: 40°. **MA 9, 12, 25, 40mm.**

each: **$37.95** (4.54)

MA12mm Illuminated Reticle Eyepiece



Excellent 3-element optical system, long eye relief, fully coated, with double crossline reticle; rubber eyecup. Wireless red LED illuminator and variable brightness control. 1.25". **Batteries included.**

$99.95 (3.45)

As above but with 6 ft. cord and plug for Meade telescopes with power panels, in place of wireless illuminator. **$79.95** (5.26)

Camera Adapters

Professional-quality adapters for rigid coupling of telescope-to-camera. Use for either Eyepiece-Projection or Prime Focus. Precision-machined of aluminum and brass, threaded for filters. Use with T-mount, available separately.

.965": $27.95; **1.25": $29.95** (3.86)

Variable-Projection Camera Adapter (1.25")

Machined sliding cell allows variable projection power in eyepiece-projection photography; permits precise selection of correct photo power in lunar and planetary photography; threaded for filters. Use with T-mount for your camera.

$39.95 (3.86)

Variable Tele-Extender

For eyepiece-projection photography with any Meade or Celestron SCT. Threads on to eyepiece-holder. Sliding cell with lock permits wide range of projection magnifications with the same eyepiece. Use with T-mount for your camera.

$39.95 (3.86)

T-Adapters for SCT's

Rigidly couples camera to telescope for prime focus photography with any Meade or Celestron Schmidt-Cassegrain. Use with T-Mount for your 35mm camera.

$26.95 (3.86)

CCD-Photo-Visual Flip-Mirror Systems

An essential accessory for imaging with ***any*** brand of CCD imager or for astrophotography with a 35mm camera. Flip mirror "down" to center the image while viewing with an eyepiece at 90°; flip mirror "up" to pass light on to CCD chip or 35mm camera film plane. Each unit includes: precision optical-flat Pyrex® mirror; 2-axis mirror-adjustment screws and locks for precise image centering; extra-fine helicoid focusing of the eyepiece; extension tubes for attaching either 35mm camera (using T-Mount) or CCD imager (using either T-threads or 1.25" barrel). Threads to rear cells of all Schmidt-Cassegrain telescopes; may remain on telescope and used in place of diagonal prism for visual observing as well.

"Over the past 10 years I have used all manner of flip-mirrors. The Meade Flip-Mirror Systems are absolutely the best—rock solid, high-precision, beautifully manufactured; they virtually eliminate all flexture between the CCD and telescope." — Jack Newton

NEW!
MEADE
FLIP-MIRROR SYSTEM
MEADE
PICTOR

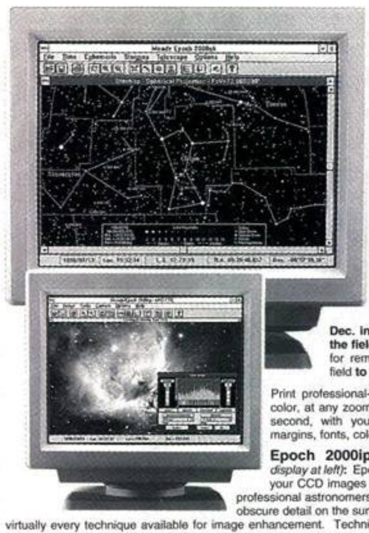
#644 Flip-Mirror System: Accepts any 1.25" eyepiece. Mirror clear aperture: 22mm. Use with CCD's up to Pictor 416XT or ST-7, or smaller; or visual observing with 1.25" eyepieces. **$149.95** (7.02)

#647 Flip-Mirror System: Accepts either 1.25" or 2" eyepieces. Mirror clear aperture: 40mm. Recommended for full-field 35mm astrophotography or with CCD's of any size, including all Meade Pictor Series through 1616XT, as well as ST-4 through ST-8; or for visual applications with 1.25" or 2" eyepieces. **249.95** (8.49)

#157 1.25" Adapter: Permits use of either Flip-Mirror on telescopes with 1.25" eyepiece-holders. (Requires approx. 2" additional focus travel with #644, 3" with #647.) **15.00** (3.86)

#644
MEADE
FLIP-MIRROR SYSTEM

#647
MEADE
FLIP-MIRROR SYSTEM



Epoch 2000® Sky Software

The most powerful astronomical software ever made available can now be yours for only $149!

Epoch 2000sk *(upper display at left)*: Now you can use the most advanced, most precise full-color sky software ever created, to zoom-in on telescopic fields **smaller than one arc second!** With star positions displayed as precisely as **0.01 arc second,** the Trapezium in Orion is no longer shown as a single point, as in other software, **but as four precisely oriented starpoints, just as they appear in the telescope.** No longer do you need to guess the R.A. and Dec. of an object located away from the field center, as in other programs: Epoch 2000sk dynamically reads out the R.A. and Dec. of the cursor position anywhere in the field **and updates R.A. and Dec. instantaneously as the cursor is moved about the field.** Meade LX200 owners can use Epoch 2000sk for remote auto-centering of objects in the telescopic field **to a precision of 30 arc seconds,** routinely!

Print professional-quality star charts in either black-and-white or color, at any zoom setting or sky scale between 180° and one arc second, with your own customized borders, headers, footers, margins, fonts, colors, and grids.

Epoch 2000ip Image Processing Software *(lower display at left)*: Epoch 2000ip makes it easy to enhance and analyze your CCD images with the same sophisticated techniques used by professional astronomers to uncover hidden structure in a spiral galaxy or obscure detail on the surface of a planet. This powerful software includes virtually every technique available for image enhancement. Techniques that bring out detail totally invisible in your original image, transforming it from the ordinary to the spectacular.

EPOCH 2000sk Sky Software: 281,000 objects supplied on 3.5" discs for Windows 3.1 or higher; fully compatible with Windows 95 .... **$149**

EPOCH 2000sk-CD Sky Software: 19 million objects, including the complete Hubble Guide Star Catalog; supplied on CD-ROM **179**

LX200 Interface Cable: for Meade LX200 operation by Epoch 2000sk **25**

EPOCH 2000ip Image Processing Software: Supplied on 3.5" discs for Windows 3.1 or higher; fully compatible with Windows 95 .... **$199**

Series 4000™ f/3.3 CCD Focal Reducer/Field Flattener

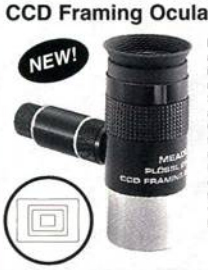
4000 f/3.3 CCD FOCAL REDUCER

NEW!

Revolutionary 3-element Meade design permits ultrafast CCD imaging with **increased** edge-of-field resolution and color correction! Reduces CCD exposure times by up to 80%. Threads on to the rear cell of any Meade or Celestron Schmidt-Cassegrain. Converts f/10 Schmidt-Cassegrain telescopes to **f/3.3** and f/6.3 SCT's to **f/2.** Variable T-Adapter (included) allows range of f/ratios between f/3 and f/5 on f/10 SCT's and between f/1.9 and f/3.2 on f/6.3 SCT's. Use with CCD imagers of any brand and chip dimensions. Not for visual or photographic applications. Multi-coated; 41mm clear aperture. **$149.95** (5.26)

Plössl 25mm Illuminated Reticle CCD Framing Ocular

NEW!



Displays rectangular frames of all popular CCD chip sizes, including all Meade Pictor models and ST-4 through ST-8. Shows precisely the image size and orientation that appear on CCD chip. Insert directly into telescope eyepiece-holder, or use with Flip-Mirror *(above)*. Includes 4-element coated Plössl optics; lockable spacer ring to fix focus position; rubber eyecup; variable LED illumination control; batteries. 1.25". **$129.95** (4.54)

#825 8 x 25mm Right-Angle Viewfinder for ETX-90

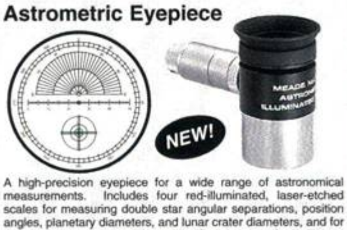
NEW!

Permits comfortable right-angle viewing. Replaces standard-equipment finder on 90mm ETX models, using the same bracket. Wide-angle, achromatic, coated optics; actual field 7.5°. Precise helicoid focusing. **$49.95** (4.26)

#64 T-Adapter for ETX®

Threads to the photo port of all ETX-90 and ETX-125 models. Rigidly couples any 35mm camera with removable lens to the telescope for lunar, planetary, or terrestrial photography. Includes extension tube for longer effective focal length, if desired. Use with T-Mount for your 35mm camera. **$34.95** (3.86)

MA12mm Illuminated Reticle Astrometric Eyepiece



NEW!

A high-precision eyepiece for a wide range of astronomical measurements. Includes four red-illuminated, laser-etched scales for measuring double star angular separations, position angles, planetary diameters, and lunar crater diameters, and for long-exposure photo-guiding. Modified Achromatic 3-element coated optics; diopter adjustment; rubber eyecup; variable LED illumination control; batteries. 1.25". **$119.95** (4.26)

Series 4000™ 8mm – 24mm Zoom Eyepiece

NEW!

The finest zoom eyepiece available. High-resolution 7-element multi-coated optics, with 55° field at 8mm. Graduated scale in 1mm units indicates exact focal length in use. High-eyepoint yields comfortable observing even with eyeglasses. Internal zoom lenses move on the smoothest, most precisely-machined tracks yet developed for zoom optics. Performance is fully consistent with the finest fixed-focal length eyepieces. Threaded for filters; rubber eyecup; 1.25". **$219.95** (6.38)

ETX® Hard Carrying Cases

For secure storage or travel with your ETX. Thick-wall construction and die-cut foam lining. Accepts telescope, plus optional eyepieces, erecting prism, table tripod, hand controller, *etc.* Includes two steel latches with key.

#774 Case for ETX-90 models: **99.95** (8.58)

#775 for ETX-125EC: **149.95** (13.38)

#932 45° Erecting Prism for ETX®

For terrestrial observing with any ETX-90 or ETX-125 model. Yields correctly oriented image and convenient 45° observing angle. Threads to ETX rear cell. Accepts any 1.25" eyepieces. Coated roof prism optics. **$49.95** (3.86)

Advanced Field Tripod for ETX-125

#887: Yields *rock-solid* stability for sensitive applications of the ETX-125, even at high magnifications. **Includes fixed-height tripod convenient for standing observations, equatorial wedge with alignment controls in azimuth and latitude angle, and #889 Tripod Adapter for ETX-125.** Permits either altazimuth or equatorial orientation of the telescope for astronomical or terrestrial observing. Tripod legs are 2"-diameter chromed steel. For field use the tripod collapses for easy transport. **$349.95** (14.00)

Tripod Adapter for ETX-125

Included with the #887 Tripod *(above)*, the #889 Adapter is available separately and permits attachment of ETX-125 directly to any Meade LX10, LX50, or LX200 Schmidt-Cassegrain Field Tripod for altazimuth observing or to any Meade Schmidt-Cassegrain Tripod-with-Equatorial Wedge or Superwedge for equatorial applications. **#889 Adapter:** **$69.95** (7.70)

ETX® Deluxe Field Tripod

#883: Custom-designed by Meade specifically for ETX-90 and ETX-125 Astro Telescopes. Tripod height adjusts from 34" to 54", for seated or standing observations. Micrometric controls in azimuth and elevation permit precise polar alignment of the ETX fork mount. Tripod head tilts and locks to 90° for terrestrial applications. Telescope attaches to tripod in seconds with 2 thumbscrews. All-aluminum construction. **$199.95** (10.00)

ETX® Carry Bag

Soft-padded Cordura-type carry bag with shoulder strap; permits storage of any 90mm ETX model, plus table tripod legs, eyepieces, other accessories. **$36.95** (5.26)

NEW!

Electric Focusers for ETX®

Meade-engineered for smooth, rapid focusing with any ETX model. Four-speed operation from coarse to microfine. Standard-equipment hand controller accepts one 9v. (user-supplied) battery and focuses all ETX telescopes. Or focus ETX/EC models through the telescope's hand controller.

#1244 Electric Focuser for all ETX-90 models: **$119.95** (6.85)

#1247 Electric Focuser for ETX-125 models: **$119.95** (6.85)

ELECTRONIC CONTROLLER
MEADE

HOW TO ORDER

Prices shown are suggested U.S.A. mail-order retail prices and do not include any applicable sales taxes. Suggested shipping and handling charges to the 48 states by U.P.S. or U.S. Mail shown in ( ) next to each price. **The following national mail-order dealers carry all Meade accessories in-stock for immediate shipment:**

ASTRONOMICS, Norman, OK.
Orders: 800-422-7876; Info.: 405-364-0858.

FOCUS CAMERA, Brooklyn, NY.
Orders: 800-221-0828; Info.: 718-436-6262.

LUMICON, Livermore, CA.
Orders: 800-767-9576; Info.: 925-447-9570.

OCEANSIDE PHOTO & TELESCOPE, Oceanside, CA.
Orders & Information: 800-483-6287.

POCONO MOUNTAIN OPTICS, Moscow, PA.
Orders: 800-569-4323; Info.: 570-842-1500.

RIVERS CAMERA, Dover, NH.
Orders: 800-245-7963; Info.: 603-742-4888.

SHUTAN CAMERA & VIDEO, Chicago, IL.
Orders & Info.: 800-621-2248; IL: 312-332-2000.

Canada:

EFSTONSCIENCE, Toronto, Ontario.
Orders & Information: 416-787-4581.

KHAN SCOPE CENTRE, Toronto, Ontario.
Orders & Information: 416-783-4140.

© 2000

Bridging the Gap

In reference to Mr. Hines's dismay expressed in the July 2000 Talking Back column, perhaps many of the readers labor under the illusion that spacecraft systems operate some version of a Microsoft operating system.

Not so. An Intel 486 running Windows is a sluggish performer, but spacecraft systems operate at a level that has nothing in common with what it takes to display the latest version of a PowerPoint slide show. Its processor architecture is wonderfully suited to running real-time software that controls payload sensors, instruments, and even spacecraft operational tasks. The replacement choice is a wonderful leap in space-qualified computing power.

Hubble has no onboard display device to serve up those breathtaking photographs. Instead, images are assembled from raw data gathered by ground-based receivers. The gap between these two computers is far more than a few hundred miles of altitude. — *Lowell Haney, Rome, Georgia*

Mir Breaks Mantra

I would like to comment on Ron Matterson's reply (August 2000) to Troy Boyle's original letter. I wish to tell both of them that the blueprint for further exploration into space currently circles some 200 miles above our heads. The Russian space station, Mir, broke the "only governments can afford space exploration" mantra when it was taken over by a private company. Since then, the Mir Corporation has funded two Progress Freighters — one manned flight and one EVA.

So, we do not need a crisis — just some private companies with money and good ideas. — *E. Philpott, South Wirral, England*

Illness No Joke

It was unfortunate that you chose to title the August issue's Strange Universe column "Planet Schizophrenia" and for Bob Berman to refer to planets with a "split personality." Schizophrenia is a common and often devastating mental illness associated with auditory hallucinations, delusions, and difficulty forming a coherent train of thought. It has absolutely nothing to do with split personalities.

Astronauts train with scuba gear for EVAs like the one that replaced Hubble's computer. NASA

Your misuse of the term "schizophrenia" insults those with the disease and helps increase the general population's ignorance about schizophrenia. A science magazine should do better. — *Jeffrey Eppler, M.D., Kelowna, British Columbia, Canada*

Red-Light District

Sky Show's August edition used only half a page to describe objects in the Scutum star cloud region. It's too bad you didn't have room to also mention the variable star V Aquilae. Like NGC 6751, this red star is outside Scutum, about 1° SSW of Lambda Aquilae. As long as your seeing is fairly good, and you can also see Lambda (16) and 12 Aql, the "glowing ember" of V Aquilae is easy to find. I discovered it accidentally. Some astronomy handbooks cite it as one of the reddest stars in the sky.

V Aql is one of the most reliable resources for refuting the statement "all stars look white to me." — *T. H. (Tom) Falconer, Saugus, California*

Counterpoint

Jennifer Baker's Rallying Point letter (September 2000) comments on how the younger generation should try to solve the problems of Earth first. I'm of high-school age myself and believe that our world's problems are largely due to gross overpopulation: Too many people, too little space.

Colonization may be the only way to save humanity. — *Jason Richardson, High Wycombe, England*

Two the Nines

I enjoy Bob Berman's Strange Universe column, but his September 2000 piece contains a mistake. If someone travels at 99.999999999 percent light speed, the dilation factor to the nearest whole number is 223,607 — not 22,361 as Berman states. His percentage is off by two nines. — *Thomas R. Shreck, Salisbury, Maryland*

Gadabout?

Rod Pommier was mistaken on page 87 (May 2000) about the location of open cluster IC 4756 in Ophiuchus. Actually, it's in Serpens Cauda. — *Fred Daugert, Bellingham, Washington*

Astronomy *invites you to talk back. Send letters to* Astronomy *Talking Back, P.O. Box 1612, Waukesha, WI 53187; e-mail to talking@astronomy.com. Letters may be edited for space and clarity. Please include your city, state, and country with all correspondence. If you want to talk back to us, please visit our website, http://www.astronomy.com.*

Astronomy®

KALMBACH PUBLISHING CO.

PRESIDENT
Gerald B. Boettcher

VICE PRESIDENT, EDITORIAL, PUBLISHER
James J. Slocum

VICE PRESIDENT, MARKETING
Michael R. Stephens

VICE PRESIDENT, ADVERTISING
Scott Stollberg

CORPORATE ART DIRECTOR
Maureen M. Schimmel

MANAGING ART DIRECTOR
Lisa A. Zehner

PRODUCTION MANAGER
Annette Wall

CIRCULATION MANAGER
Michelle Spehr

CIRCULATION SPECIALIST
Kirsten King

ADVERTISING DEPARTMENT
(888) 558-1544

ADVERTISING SERVICES MANAGER
Sara Malin Everts

ADVERTISING SALES MANAGER
Howard Hoerl hhoerl@astronomy.com

ADVERTISING SALES REPRESENTATIVE
Michael Ellis mellis@astronomy.com

AD SERVICES REPRESENTATIVE
Joel Wingelman jwingelman@kalmbach.com

RETAIL TRADE ORDERS AND INQUIRIES:
(800) 558-1544, ext. 818; outside the U.S. and Canada: (262) 796-8776, ext. 818

SPECIAL E-MAIL ADDRESSES

Ask Astro askastro@astronomy.com

Hot Shots hotshots@astronomy.com

Star Stuff starstuff@astronomy.com

Talking Back talking@astronomy.com

Kids kids@astronomy.com

Customer Service customerservice@kalmbach.com

Ad Sales adsales@astronomy.com

Africa Eclipse Expedition

Join Eclipse Edge Expeditions June 14-22, 2001 as we explore Victoria Falls, Zimbabwe. Itinerary includes animal safari and best view of the total solar eclipse -- from near the path edge, where more and longer totality phenomena are seen.

Run by professional astronomers; our experienced team has selected sites to maximize weather prospects and will have mobility available if needed. Astronomy program includes southern sky observing. Optional activities include white water rafting, bungee jumping, elephant ride; and tethered balloon or helicopter view of the falls.

From $1750
short program originating in Johannesburg

To $3900
full program, air from Washington, DC

Eclipse Edge Expeditions 'Z01
P.O. Box 15186
Chevy Chase, MD 20825-5186
800-898-3343 (recording)
http://metaresearch.org/edge

The Fujinon Constellation

Named one of the year's 25 top astronomy products, Fujinon's 14x40 TECHNO-STABI™ ends the jittery images associated with high power, handheld binoculars. Using an advanced digital stabilizing system so effective, it even permits making observations from boats, planes and helicopters. It is also the only 100% waterproof image-stabilizing binocular.

Flat-field POLARIS™ Series binoculars give you the world's brightest, high-resolution images. *Sky & Telescope* said the 7x50 was "incredible" and unlike the competition, had longer (23mm) eye relief and a tripod adapter socket. POLARIS distortion-free optics increase the useful field area more than 40% by eliminating defocused star images near the field stop. POLARIS Series: 7x50,10x70 and 16x70. 100% waterproof. Mil Spec. Lifetime limited warranty.

Fujinon's exclusive 25x150 and 40x150—the world's largest production binoculars—have earned the title "Comet Finder" (the most recent find being Hyakutake). Their incredible optics let you enjoy the widest, sharpest and brightest high-contrast views of globular clusters, galaxies and delicate nebulae detail. Also available with extra low dispersion ED glass. 100% waterproof. Mil Spec. Lifetime limited warranty.

FUJINON INC.
10 High Point Drive
Wayne, NJ 07470
(973) 633-5600 FAX (973) 694-8299

FUJINON

The definitive website for astronomy

We invite you to visit *Astronomy.com* — the newly redesigned and enhanced website from the publishers of *Astronomy* Magazine.

At the heart of *Astronomy.com* are eight core content areas: News, Feature Stories, Observing, Image Gallery, Educational Resources (Parents and Teachers), Kids' Corner, Getting Started, and Shopping. These eight sections offer visitors a wide variety of information in an easy to navigate, highly dynamic and interactive format.

Areas such as News are updated daily — more frequently when warranted. Tonight's Sky showcases objects currently visible, while our interactive star chart allows visitors to create a personalized view from any position on Earth at any time of day or date. The redesigned site also offers parents and teachers activities to help feed the interest of their charges.

Throughout history, astronomy has tempted the inquisitive nature of humans. The staff of *Astronomy.com* intends to foster that curiosity by producing the definitive website of astronomy. We hope each of our visitors learns something new every single day.

Andrea Gianopoulos

Andrea Gianopoulos, Editor

5657-0011

Explore our

stellar new site!

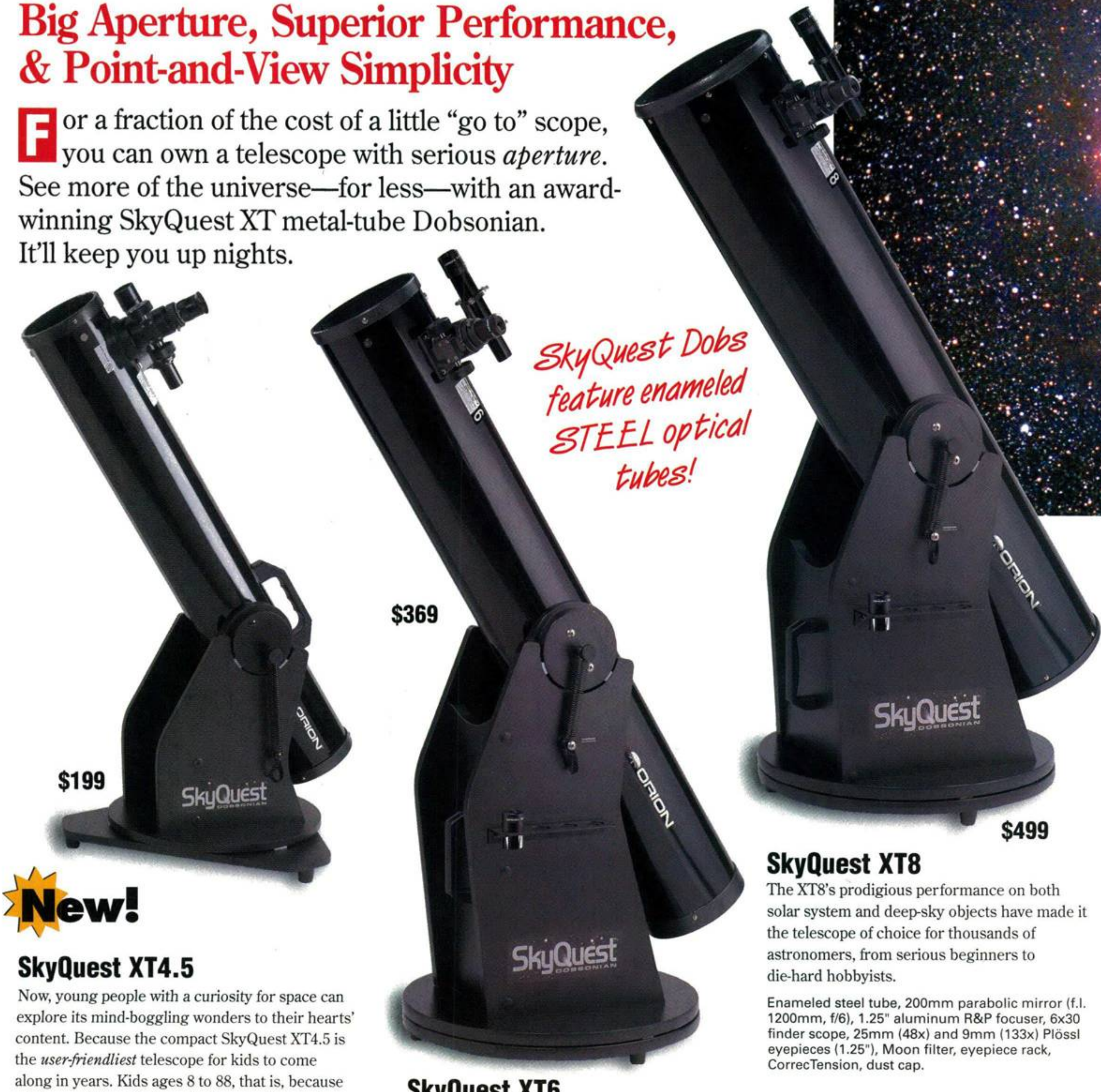
- Delve into the latest news and feature stories — you'll find something for every level of interest.
- A convenient one-stop shopping service offers the widest selection of astronomy products on one site.
- Discover the telescope that best suits your needs with our interactive guide.
- Customizable star charts — the sky from your backyard or vacation destination
- Scheduled live chats with scientists
- Club calendars and message boards
- PLUS — Astronomy Bulletin Service (ABS), customizable weather, a complete guide to sky events and star parties, resources for parents and teachers, an extensive photo gallery, and more!

Astronomy.com

Orion® SkyQuest™ XT Dobsonian Telescopes

Big Aperture, Superior Performance, & Point-and-View Simplicity

For a fraction of the cost of a little "go to" scope, you can own a telescope with serious *aperture*. See more of the universe—for less—with an award-winning SkyQuest XT metal-tube Dobsonian. It'll keep you up nights.



SkyQuest Dobs feature enameled STEEL optical tubes!

$199

New!

SkyQuest XT4.5

Now, young people with a curiosity for space can explore its mind-boggling wonders to their hearts' content. Because the compact SkyQuest XT4.5 is the *user-friendliest* telescope for kids to come along in years. Kids ages 8 to 88, that is, because adults won't be able to resist its portability, crisp optical performance, and point-and-view simplicity, either.

Enameled steel tube, 114mm mirror (f.l. 910mm, f/8), 1.25" R&P focuser, 6x30 finder scope, 25mm (36x) and 9mm (110x) Plössl eyepieces (1.25"), CorrecTension, built-in handle, dust cap.

$369

SkyQuest XT6

The overachieving XT6 will show Jupiter's Red Spot, Saturn's Cassini Division, hundreds of clusters and nebulas, and galaxies tens of millions of light-years distant. Nicely portable and very affordable!

Enameled steel tube, 152mm parabolic mirror (f.l. 1200mm, f/8), 1.25" aluminum R&P focuser, 6x30 finder scope, 25mm (48x) and 9mm (133x) Plössl eyepieces (1.25"), Moon filter, eyepiece rack, CorrecTension, dust cap.

$499

SkyQuest XT8

The XT8's prodigious performance on both solar system and deep-sky objects have made it the telescope of choice for thousands of astronomers, from serious beginners to die-hard hobbyists.

Enameled steel tube, 200mm parabolic mirror (f.l. 1200mm, f/6), 1.25" aluminum R&P focuser, 6x30 finder scope, 25mm (48x) and 9mm (133x) Plössl eyepieces (1.25"), Moon filter, eyepiece rack, CorrecTension, dust cap.

ORION
SkyQuest

M. Lorenzi/G. Favretto

New!

$649

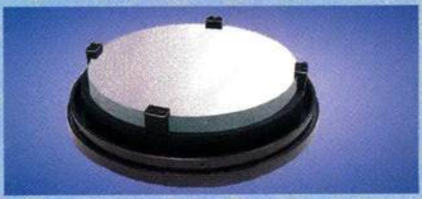
SkyQuest XT10

Aperture rules. So meet the new telescope King. Its 250mm-diameter parabolic mirror gulps in over 50% more light than an 8" scope, to reach farther into deep space. The sheer number of objects visible in the XT10 is staggering, and its prodigious resolving power reveals intricate structure in nebulas and galaxies that's invisible in smaller scopes.

Enameled steel tube, 250mm parabolic mirror (f.l. 1255mm, f/5), 2" aluminum R&P focuser, big 8x50 finder scope, 25mm (50x) and 9mm (139x) Plössl eyepieces (1.25"), Moon filter, eyepiece rack, CorrecTension, dust cap.

The XT10 - A Big Dob With Better Features

The XT10 and all other XT models feature a professional-quality, enameled steel optical tube, not cardboard as on cut-rate Dobs.

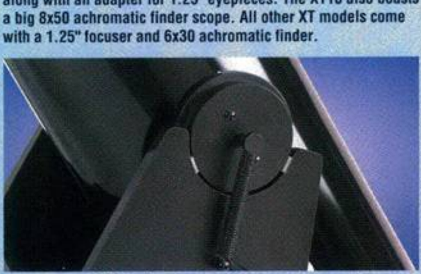


The XT10's diffraction-limited 250mm parabolic primary mirror collects over 50% more light than an 8" mirror, to reach farther into deep space!

Plössl 9mm
Plössl 25mm

The XT10, like all SkyQuest Dobs, comes standard with two fully coated Plossl eyepieces (1.25"): 25mm (50x) and 9mm (139x).

A 2" aluminum rack-and-pinion focuser is standard on the XT10, along with an adapter for 1.25" eyepieces. The XT10 also boasts a big 8x50 achromatic finder scope. All other XT models come with a 1.25" focuser and 6x30 achromatic finder.



All SkyQuest telescopes have large 5" flanged altitude hubs and Orion's exclusive CorrecTension Friction Optimization, for superior balance and motion control.

ORION
TELESCOPES & BINOCULARS

Our 25th Year!

Everything for the Amateur Astronomer – Delivered Direct

FREE 100-PAGE CATALOG Call toll-free (800) 447-1001

Selected Orion products are also available at authorized astronomical dealers.

Shipping/handling is additional. Dealer prices may vary.

telescope.com

exploration destination

Just because you favor dark skies doesn't mean you should be in the dark when it comes to shopping for Astronomy gear. At eHobbies you will find everything you need for your next star party, including telescopes and accessories, binoculars, star charts, books and software. Whether you're a backyard astronomer or an expert looking for the next great celestial discovery, our unparalleled customer service will save you enough time to tackle the Messier marathon.

COMPUTERIZED SCOPES

8" NexStar Telescope
by CELESTRON
eHobbies price: $1,899.99
▲ Item #1003-9772

5" NexStar Schmidt-Cassegrain Telescope
by CELESTRON
eHobbies price:$1,199.99
▲ Item #1004-1135

G-5 Schmidt-Cassegrain Telescope
by CELESTRON
eHobbies price: $699.99
▲ Item #1004-1133

C5 Schmidt-Cassegrain Spotting Scope
by CELESTRON
eHobbies price: $599.99
▲ Item #1004-2483

G-5 with Motor Drive Telescope
by CELESTRON
eHobbies price: $749.99
▼ Item #1004-1134

Focal Reducer/Corrector Celestron F/6.3
by CELESTRON
eHobbies price: $119.99
▼ Item #1004-2257

8" Ultima 2000 Telescope
by CELESTRON
eHobbies price: $2,899.00
▲ Item #1004-1137

CM - 1400 Schmidt-Cassegrain 14"
by CELESTRON
eHobbies price: $5,699.99
▲ Item #1004-2470

G - 9 1/4" Schmidt-Cassegrain
by CELESTRON
eHobbies price: $1,399.99
▲ Item #1004-1262

8" Celestar Deluxe Schmidt-Cassegrain
by CELESTRON
eHobbies price: $1,699.99
▼ Item #1004-1347

CM - 1100: 11" Schmidt-Cassegrain
by CELESTRON
eHobbies price: $3,399.99
▼ Item #1004-2468

G - 8 Schmidt-Cassegrain
by CELESTRON
eHobbies price: $999.99
▼ Item #1004-2441

we carry products from these great manufacturers...

Celestron, Fujinon, Bushnell, Zeiss, Kalmbach, Meade, Pelican Products, Sienna Software, Sky Publishing and more.

search our site

Find anything you see in this ad by entering the eight digit item number in our search box, then click the "search" button.

1-888-eHobbies

order by phone – 24 hours a day, 7 days a week

©2000 eHobbies.com, Inc. All rights reserved. The eHobbies logo and "creating a new world for hobbyists" are servicemarks of eHobbies.com, Inc.

9x63 Ultima Series Binocular
by CELESTRON
eHobbies price: $349.99
▲ Item #1003-9768

11x80 Observer BCF Binocular
by SWIFT INSTRUMENTS
eHobbies price: $479.99
▲ Item #1004-3314

300DX Tripod
by SLIK
eHobbies price: $119.99
▲ Item #1004-4385

1400 Medium Telescope Case
by PELICAN PRODUCTS
eHobbies price: $54.99
▲ Item #1004-3573

8x56 Victory Series Binocular w/Pouch
by ZEISS OPTICAL
eHobbies price: $1,099.99
▼ Item #1004-2155

10x70 MT SX Poseidon Series Binocular
by FUJINON
eHobbies price: $518.99
▲ Item #1004-3160

8x56 Ultima Series Binocular
by CELESTRON
eHobbies price: $289.99
▼ Item #1003-9767

FOR THE BEGINNER

100x4.5" Voyager Compact Telescope
by BUSHNELL
eHobbies price: $189.99
▲ Item #1004-1786

Firstscope 80 EQ - WA Telescope
by CELESTRON
eHobbies price: $299.99
▲ Item #1004-1104

Firstscope 76 EQ Newtonian Telescope
by CELESTRON
eHobbies price: $159.99
▲ Item #1004-1115

48x6" Voyager Series Telescope
by BUSHNELL
eHobbies price: $299.99
▼ Item #1004-1799

TableTop 76 Newtonian Telescope
by CELESTRON
eHobbies price: $99.99
▲ Item #1004-1114

Firstscope 114 Deluxe Newtonian
by CELESTRON
eHobbies price: $299.99
▼ Item #1004-1119

We are an authorized dealer of Meade products.

AST_0007

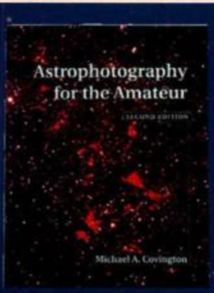
www.eHobbies.com
AOL Keyword: eHobbies

eHobbies℠
creating a new world for hobbyists℠

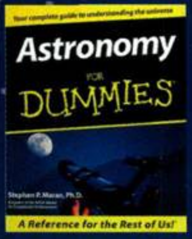
GREAT FOR BEGINNERS

20x80 Satellite Binocular
by SWIFT INSTRUMENTS
eHobbies price: $509.99
▲ Item #1004-3315

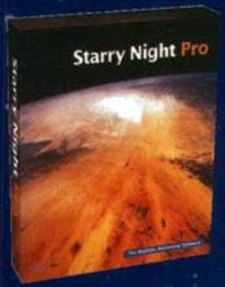
C102-HD Refractor Telescope
by CELESTRON
eHobbies price: $499.99
▲ Item #1003-9769



Astrophotography For The Amateur, 2nd Ed
by SKY PUBLISHING CORPORATION
eHobbies price: $34.99
▲ Item #1004-3439

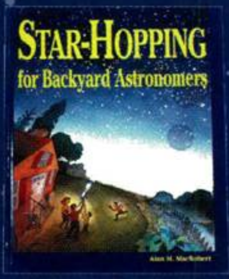


Astronomy For Dummies
by SKY PUBLISHING CORPORATION
eHobbies price: $19.99
▲ Item #1004-3435

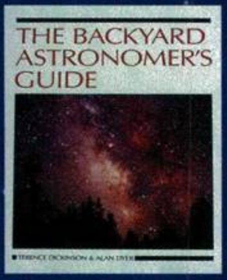


Starry Night Pro Astronomy Software
by Space.com
eHobbies price: $144.99
▲ Item #1004-0651

Star-Hopping For Backyard Astronomers
by SKY PUBLISHING CORPORATION
eHobbies price: $22.99
▼ Item #1004-3527



The Backyard Astronomer's Guide
by SKY PUBLISHING CORPORATION
eHobbies price: $39.99
▼ Item #1004-3443



Flashlight Skylite Red / White LED
by SKY PUBLISHING CORPORATION
eHobbies price: $34.99
▼ Item #1004-3501

C150-HD 6" Newtonian Telescope
by CELESTRON
eHobbies price: $649.99
▲ Item #1004-1126

Firstscope 114 Telescope
by CELESTRON
eHobbies price: $249.99
▲ Item #1004-1285

8" Star Hopper Telescope
by CELESTRON
eHobbies price: $414.99
▲ Item #1004-1131

Celestron Ultima (5 Element) 42mm 1.25"
by CELESTRON
eHobbies price: $98.99
▲ Item #1004-1245

Barlow Lens Deluxe Celestron 2 X 1.25"
by CELESTRON
eHobbies price: $39.99
▲ Item #1004-1471

CR-150-HD 6" Refractor Telescope
by CELESTRON
eHobbies price: $1,249.99
▼ Item #1004-1111

Firstscope 70 EQ Telescope
by CELESTRON
eHobbies price: $229.99
▼ Item #1004-1095

Star Hopper 4 1/2 Telescope
by CELESTRON
eHobbies price: $239.99
▼ Item #1004-1128

eHobbies TV

Tune into the Astronomy Channel on eH TV for incredible streaming video programs, including a feature on rovers in outer space.

hot deals

Find amazing deals on optics, media and accessories in our Hot Deals area anytime.

1-888-eHobbies *order by phone – 24 hours a day, 7 days a week*

©2000 eHobbies.com, Inc. All rights reserved. The eHobbies logo and "creating a new world for hobbyists" are servicemarks of eHobbies.com, Inc.

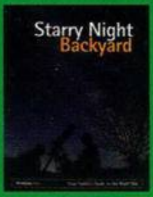
Log onto our website for a complete catalog and current prices.*

ACCESSORIES

Item #	Description	Manufacturer	Price
1004-3409	1120 Eyepiece Accessory Case	Pelican Products, Inc	24.99
1004-3412	1300 Eyepiece Accessory Case	Pelican Products, Inc	58.99
1004-4395	Slik 504 QFII Tripod	Tocad	129.99
1004-2260	Nexstar Tripod	Celestron	193.99
1004-2562	Equatorial Mount - CG-3	Celestron	159.99
1004-2887	Motor Drive SA-CG3 for CG3 Mounts	Celestron	119.99
1004-2566	Equatorial Mount - CG-5	Celestron	469.99
1004-2667	Counterweight, Extra 11# for CG-5 Mount	Celestron	39.99
1004-2248	Binocular Tripod Adapter	Celestron	19.99
1004-1254	Celestron Lanthanum 10mm Ocular 1.25"	Celestron	105.99
1004-1255	Celestron Lanthanum 12mm Ocular 1.25"	Celestron	115.99
1004-1256	Celestron Lanthanum 15mm Ocular 1.25"	Celestron	105.99
1004-1247	Celestron Lanthanum 2.5mm Ocular 1.25"	Celestron	115.99
1004-1230	Celestron Plossl Nexstar 13mm 1.25"	Celestron	40.99
1004-1234	Celestron Plossl Nexstar 40mm 1.25"	Celestron	49.99
1004-1227	Celestron Plossl Nexstar 8mm 1.25"	Celestron	40.99
1004-1243	Celestron Ultima (5 Element) 30mm 1.25"	Celestron	98.99
1004-1244	Celestron Ultima (5 Element) 35mm 1.25"	Celestron	115.99
1004-1239	Celestron Ultima (5 Element) 5mm 1.25"	Celestron	79.99
1004-1240	Celestron Ultima (5 Element) 7.5mm 1.25"	Celestron	79.99
1004-1268	Eyepiece Filter Set 1-1/4(21,80A,ND-13	Celestron	44.99
1004-2246	Adapter AC for Celestar 8	Celestron	15.99
1004-2247	Adapter AC for Celestar 8 Deluxe/U2000	Celestron	15.99
1004-2249	Adapter DC, Car battery for Celestar 8	Celestron	15.99
1004-1287	Camera T-Ring Canon, Celestron	Celestron	14.99
1004-1425	Camera T-Ring Nikon, Celestron	Celestron	14.99
1004-1275	T-Adapter (C5/C8/G8/G9.25"/C11/C14)	Celestron	24.99
1004-2857	Dew Shield Celestron C90	Celestron	19.99
1004-2255	Dew Shield Celestron C8	Celestron	32.99
1004-2830	Finderscope (Polaris) 7x50 w/illuminator	Celestron	181.99
1004-2773	Finder Bracket - Quick Release	Celestron	42.99
1004-2856	LensPen - Optics Cleaning Tool	Celestron	9.99
1004-2253	Flashlight, Night Vision	Celestron	19.99
1004-2628	Collimation Tool for Newtonians	Celestron	32.99

gift shop

Our Gift Shop is filled with items sure to provide Holiday Cheer for any astronomer. Choose from our wide selection of optics and accessories for beginners or buy a gift certificate for the astronomy expert.



Starry Night Backyard Astronomy Software
by Space.com
eHobbies price: $59.99
Item #1004-0653

7x50 Enduro Series Binocular
by CELESTRON
eHobbies price: $44.99
Item #1004-1202

wish list

Wish someone would buy you the perfect gift? Visit our Gift Shop to create a list of items you want so friends and family know exactly what to get you this holiday season.

Star Hopper 6" Telescope
by CELESTRON
eHobbies price: $339.99
Item #1004-1130

Firstscope 114 Short Newtonian Telescope
by CELESTRON
eHobbies price: $229.99
Item #1004-1122

ASTRO MEDIA

Item #	Description	Manufacturer	Price
1004-3426	Adv. Telescope Making Techniques Vol.1	Sky Publishing	24.99
1004-3429	Adv. Telescope Making Techniques Vol.2	Sky Publishing	24.99
1004-3483	Astronomical Equipment for Amateurs	Sky Publishing	39.99
1004-3436	Astronomy: A Self Teaching Guide	Sky Publishing	18.99
1004-3441	Atlas of Deep-Sky Splendors, 4th Edition	Sky Publishing	24.99

Item #	Description	Manufacturer	Price
1004-2323	Beginner's Guide for Amateur Astronomy	Sky Publishing	16.99
1004-5497	Exploring the Moon thru Binocs & Sm Tel	Sky Publishing	18.95
1004-2558	Meade Star Charts	Sky Publishing	18.99
1004-2326	Photographic Atlas of the Stars	Sky Publishing	39.99
1004-5504	The Messier Objects	Sky Publishing	34.95

MORE BINOCULARS & TELESCOPES

Item #	Description	Manufacturer	Price
1004-1217	7x50 Ultima Series Binocular	Celestron	239.99
1004-1218	10x50 Ultima Series Binocular	Celestron	239.99
1004-1223	20x80 Deluxe Giant Binoculars	Celestron	429.99
1004-2121	8x56 Classic Series Zeiss w/pouch	Zeiss Optical, Inc.	1199.99
1004-2156	10x56 Victory Series Binocular w/Pouch	Zeiss Optical, Inc.	1179.99

Item #	Description	Manufacturer	Price
1004-5493	60MM Cmpt Star Locator Refractor	Bushnell	199.99
1004-1097	70EQ Aluminum Refractor	Celestron	239.99
1004-1286	Firstscope 114 Premium	Celestron	349.99
1004-1126	C114 HD Refractor	Celestron	439.99
1004-1407	8" Celestar SCT	Celestron	1099.99

We are an authorized dealer of Meade products.

AST 0007

***All prices are subject to change.**

www.eHobbies.com

AOL Keyword: eHobbies

eHobbies℠

creating a new world for hobbyists℠

HUBBLE SPACE TELESCOPE

Census Shows Brown Dwarfs Numerous

▶ Six years ago, no one knew for sure that they existed. Now brown dwarfs seem to be turning up everywhere. Recent observations with the Hubble Space Telescope confirm that brown dwarfs bridge the entire gap between stars and planets and that large numbers of them float freely in star clusters.

Brown dwarfs rank among the most elusive objects in the universe. With masses from about 15 to 80 times that of Jupiter, they are bigger than planets but too small to ignite the nuclear fusion reactions that cause stars to shine (see "The Little Stars That Couldn't," August 1999). Glowing only with the heat left over from their formation, they quickly fade to levels that put even Hubble to the test.

That's why two teams of astronomers targeted the young star clusters IC 348 in Perseus and the Trapezium cluster at the heart of the Orion Nebula (M42). The younger a brown dwarf, the hotter and brighter it glows. In the most complete census to date, they found approximately 30 brown dwarfs in IC 348 and 50 in the central region of the Trapezium.

The team led by Joan Najita of the National Optical Astronomy Observatories used Hubble's NICMOS camera to study the infrared radiation emanating from the objects in IC 348. The researchers developed a new technique to measure the temperature of each object. This allowed them to distinguish brown dwarfs in the cluster from background stars and improved their estimates of the brown dwarfs' masses.

They found that more low-mass brown dwarfs exist than high-mass ones — mimicking the behavior of stars — and that this trend continues down nearly to planetary masses. They also found that far more brown dwarfs float freely than orbit stars.

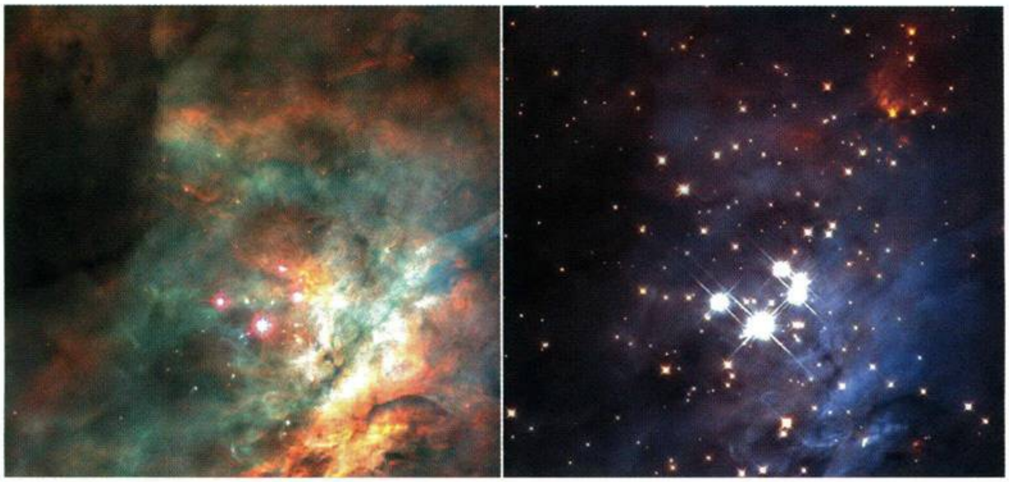
"This suggests that stars and free-floating brown dwarfs form in the same way," says Najita. Basically, large clouds of interstellar gas and dust collapse under the influence of gravity. Planets, on the other hand, grow from tiny dust particles that collide and stick together, creating progressively bigger objects until reaching planet size.

The second team, led by Kevin Luhman of the Harvard-Smithsonian Center for Astrophysics, used NICMOS to take an infrared image of the Trapezium. The image reveals more than 300 fledgling stars and brown dwarfs, the latter being the faintest points of light visible. All these objects have formed within the last million years as the Orion Nebula spawns a whole new generation of stars. (The Trapezium gets its name from the trapezoidal shape of the bright, massive stars at the cluster's center.)

The two studies show that nearly as many brown dwarfs exist as stars. "Nature does not discriminate between stars that can shine by fusion and lower mass objects that are unable to do so," says Najita.

Despite their prodigious numbers, however, brown dwarfs apparently contribute little to the so-called dark matter that makes up approximately 90 percent of the Milky Way Galaxy's mass. The researchers estimate that these objects can supply no more than about 0.1 percent of the galaxy's dark matter.

— Richard Talcott


NASA/STScI

About 50 brown dwarfs show up in an infrared view of Orion's Trapezium cluster (the fainter objects at right) but appear too dim to see in visible light (left).

GALILEO MISSION

Europa's Slushy Subsurface

▶ Thanks to the tenacity of a mechanized explorer bearing the name of a 17th-century genius, the convincing case for a liquid ocean percolating beneath the surface of Jupiter's fourth largest moon just got stronger. Recent data culled from the magnetometer onboard NASA's Galileo spacecraft — dutifully serving for the last 10 years as a testament to the fact that NASA once exhibited a flair for overcoming unexpected mechanical malfunctions — reveals that a layer of subsurface water may currently lie beneath the icy crust of Europa. Because water is

Discovery CHANNEL
STORE™

headquarters for
MEADE®
telescopes
and accessories

Win a Meade 8", 10" or 12" LX200 or an ETX-90EC! Enter the Discovery Channel Store Sweepstakes, Oct. 25 - Dec. 17, 2000.
Details in stores.

See the complete collection of Meade telescopes at your local Discovery Channel Store.

ETX-60AT
$299*

ETX-90EC
$595*

ETX-125EC
$895*

*plus sales tax and shipping, if applicable

For the store nearest you please call toll free 1-877-DCI-STORE
or order online at www.discoverystore.com

a common tracer of terrestrial life, this discovery could profoundly affect the preliminary steps in the search for life beyond Earth.

After a revealing flyby from the Voyager 2 spacecraft in 1979, scientists started to suspect that the surface of Europa consisted largely of water ice. And with the arrival of Galileo at Jupiter's doorstep in 1995, evidence for past dynamic surface activity began rolling in, including fractures and ice floes caused by liquid seeping from below the crust. Nonetheless, until now, planetary scientists lacked strong evidence that liquid water, rather than the frozen remnants of a fluid ocean, lies below the surface of Europa today.

A team of researchers led by Margaret Kivelson of UCLA published its interpretation of the Galileo data gathered during a number of passes by the icy moon from December 1996 to January 2000.

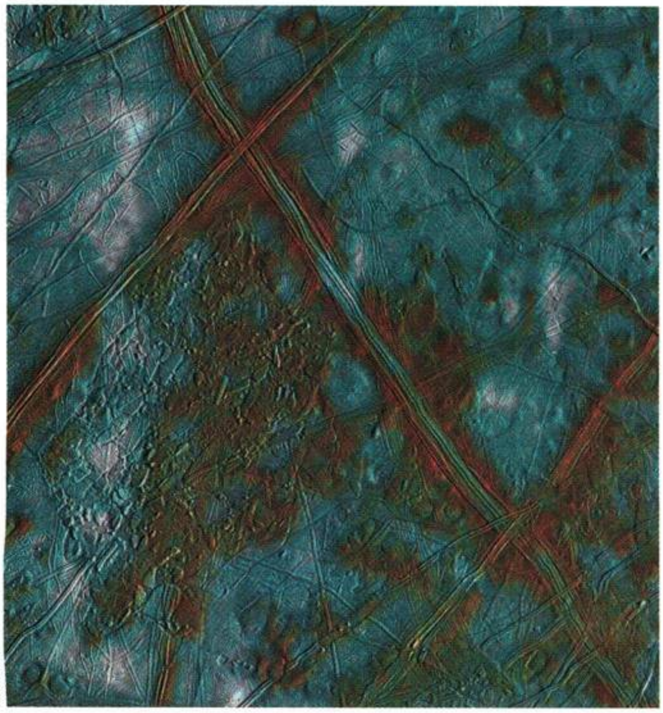
Reporting in the August 25, 2000, *Science*, the team showed that periodic changes in the direction of magnetic fields near Europa, whose orbit rests inside the jovian magnetosphere, are consistent with an electrically conducting layer beneath the surface of the moon. "The direction that a magnetic compass on Europa would point flips around in a way that's best explained by the presence of a layer of electrically conducting liquid, such as saltwater, beneath the ice," says Kivelson.

Without more conclusive results, some scientists caution that we shouldn't close the book on what lies beneath Europa's icy surface just yet. "The evidence is still indirect and requires several steps of inference to get to the conclusion that there is really a salty ocean," explains Torrence Johnson of NASA's Jet Propulsion Laboratory in Pasadena, California. "A definitive answer could come from precise measurements of gravity and altitude to check for effects of tides."

NASA is currently planning to launch a mission in 2003 that will go into orbit around Europa and could provide such answers.

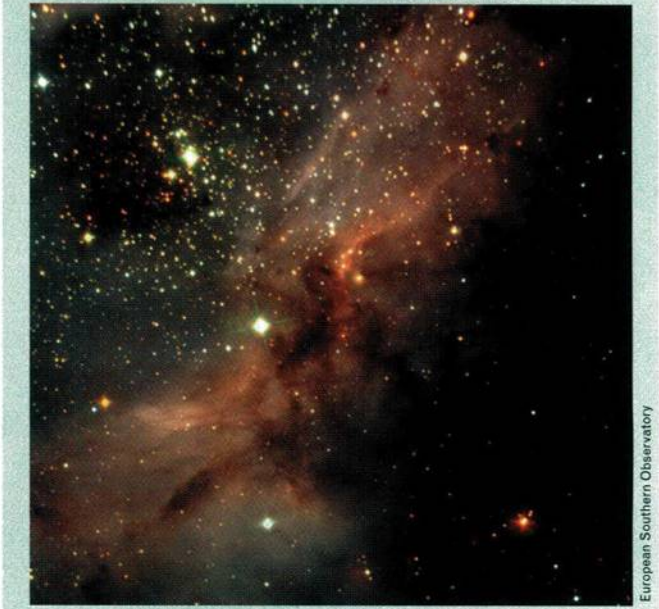
— William Schomaker

Measurements of Europa's magnetic field taken over the past five years by the Galileo spacecraft support the idea that a slushy ocean lies beneath the moon's frozen surface.



NASA/JPL

NEW TECHNOLOGY TELESCOPE



European Southern Observatory

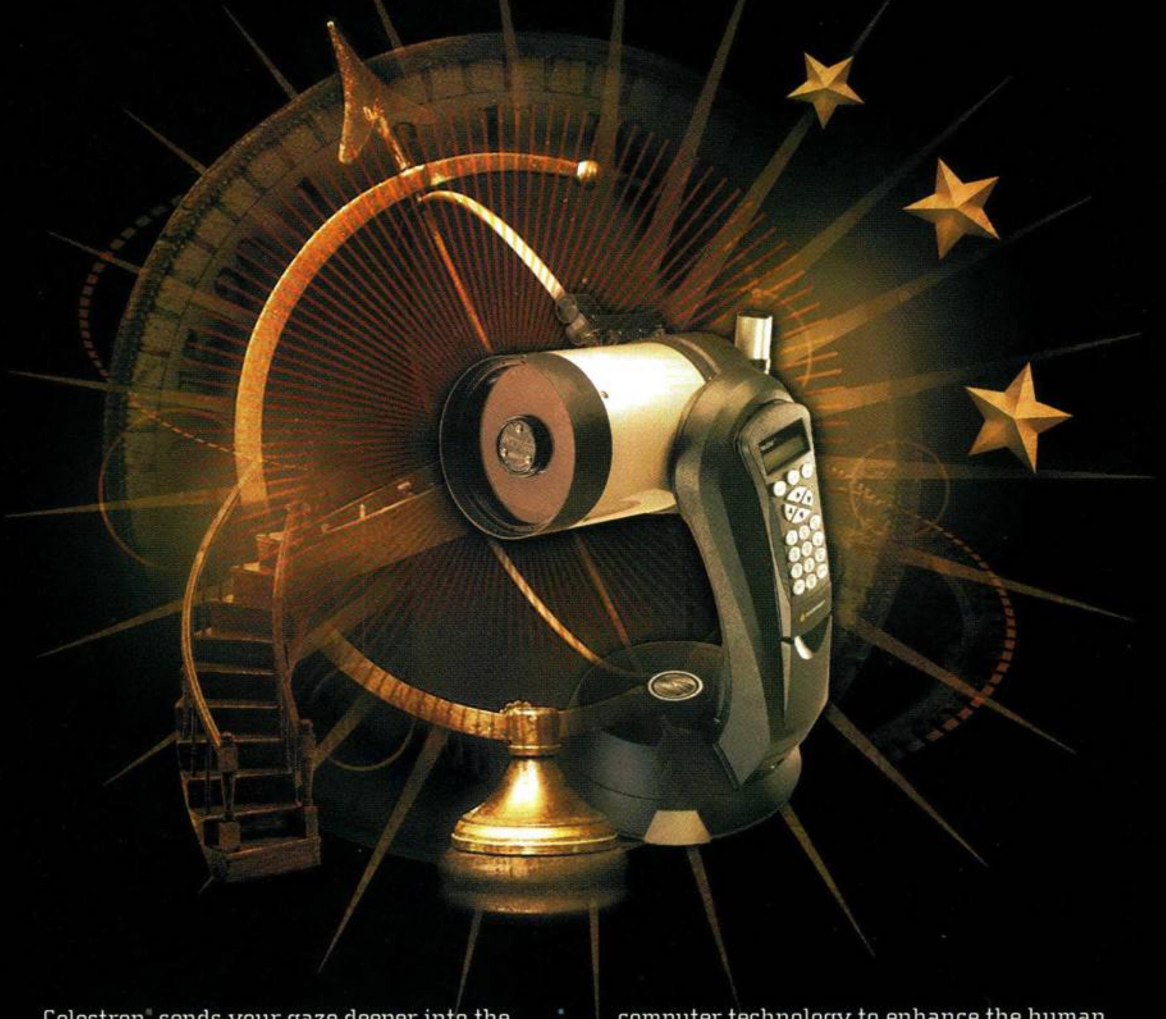
MASSIVE STARS POPULATE the southwestern part of the emission nebula M17 in Sagittarius, also known as the Swan or Omega Nebula. This deep and unusually wide view into the giant star-forming region comes courtesy of the European Southern Observatory's 3.6-meter New Technology Telescope at La Silla, Chile. The false-color image was taken at near-infrared wavelengths, helping to penetrate the dusty environment. The reddish objects are young and heavily obscured stars. Bluer objects represent either foreground stars or massive stars that have already formed and whose intense ultraviolet light ionizes the hydrogen in their vicinity. The diffuse light visible nearly everywhere comes from electrons recombining with protons to form hydrogen atoms, and the dark areas depict dust obscuring the light from background objects.

CHANDRA OBSERVATORY

Black Holes in All Sizes

▶ Astronomers have long thought that black holes come in two main flavors. The more common, garden-variety black hole has a mass a few times that of the sun. They form when a massive star exhausts its nuclear fuel and implodes.

If You Look Hard Enough, You Can See The Future.



Celestron® sends your gaze deeper into the star-studded past of our universe by keeping one eye steady on the future. Hand-figured optics, precisely ground, perfectly matched and thoroughly tested, capture and focus the slightest glimmer of light. Breakthrough engineering thoughtfully employs the latest computer technology to enhance the human experience. Whether you select one of our advanced catadioptric telescopes, a refractor or a reflector scope, Celestron opens your eyes to the sky like no one else. If you want to use the technology of the future to see far into the past of space, look no further than Celestron.

FOR MORE INFORMATION ABOUT CELESTRON®: (310) 328-9560 • WWW.CELESTRON.COM

CELESTRON®

If the star's collapsing core contains more than two or three solar masses, nothing can halt the collapse and a black hole is born.

Much rarer are supermassive black holes, objects that contain millions or billions of solar masses and reside in the centers of galaxies. As gas, dust, and even stars get sucked toward a supermassive black hole, the material gets heated to millions of degrees and glows brilliantly at all wavelengths. These beacons are the quasars and other active galaxies that can be seen across much of the observable universe.

Now astronomers using the Chandra X-ray Observatory have discovered a third black-hole flavor, one having a mass between the other two. They found this midsized black hole about 600 light-years from the center of M82, a bright galaxy located in Ursa Major. The black hole packs the mass of at least 500 suns into a region about the size of our moon.

"This opens a whole new field of research," says Martin Ward of the University of Leicester in England, who led one of the three teams that made the discovery. "No one was sure that such black holes existed, especially outside the centers of galaxies."

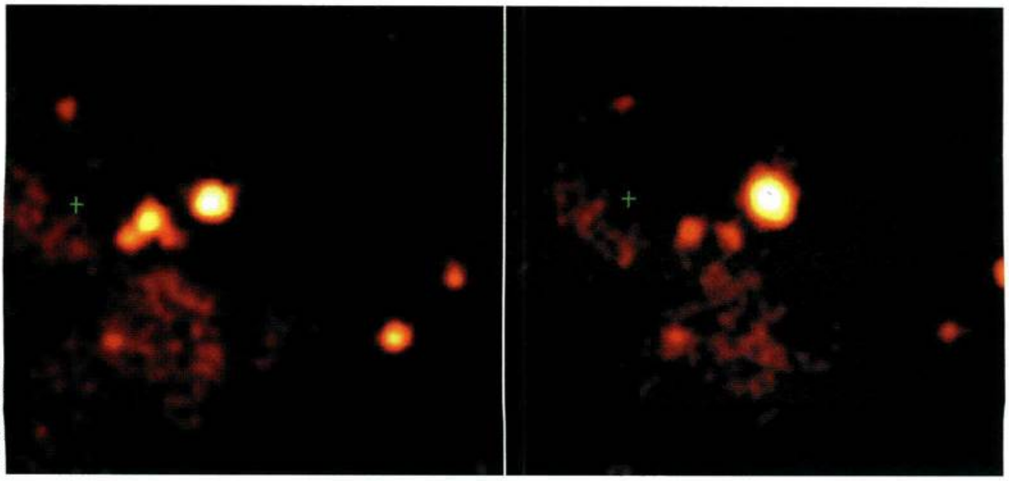
Earlier x-ray observations made with ROSAT and the Advanced Satellite for Cosmology and Astrophysics had hinted that a midsized black hole might exist in M82. The latest breakthrough came when astronomers compared the high-resolution images from Chandra with optical, radio, and infrared maps of the same region. The researchers concluded that most of the x rays came from a single bright source.

Repeated observations over an eight-month span showed that the intensity of the x rays rose and fell with a 10-minute period. "This flickering of the x-ray intensity is similar to the well-studied characteristics of black holes swallowing gas from a nearby star or cloud," says Philip Kaaret of the Harvard-Smithsonian Center for Astrophysics, another team leader. "Explanations other than a massive black hole for this object are implausible."

How such an object could form remains a mystery. One idea suggests it could be a remnant created by the collapse of a "hyperstar," a theoretical object much more massive than any known star. Another holds that the black hole could arise from the merger of dozens of stellar-mass black holes. In any case, the black hole in M82 may eventually sink to the galaxy's center and grow into a supermassive black hole.

The discovery also raises the possibility that the Milky Way Galaxy might contain midsized black holes. Hundreds of these objects could lurk unseen in the galaxy, cut off from a supply of fresh gas that would help betray their presence. — R. T.

A midsized black hole (the source changing in brightness) appears offset from M82's center (cross).



NASA/SAO/CXC

NRAO/AUI taken by Mike Bailey

The Green Bank Telescope rises in the mountains of West Virginia.

RADIO ASTRONOMY

First Light for Radio Telescope

▶ If you ever need to drive through the rugged mountains of eastern West Virginia, don't forget to bring along your favorite cassettes or CDs. A quick scan up and down the car's radio dial will convince you that you aren't in the city anymore. But if you think the region's mountainous terrain and isolation from urban areas explains the paucity of radio stations, you're only partly right.

The area surrounding Green Bank, West Virginia, belongs to the National Radio Quiet Zone. Here, the National Radio Astronomy Observatory (NRAO) can influence the use of ground-based transmitters to reduce radio frequency interference, making this one of the quietest sites in the United States for doing radio astronomy.

The chief beneficiary of this effort is NRAO's Green Bank Observatory and its

1

Does the night sky leave you in the dark?

Answer the following questions to determine your intergalactic know-how.
(Hint: Download a FREE trial version of Starry Night™ at www.StarryNight.com and cheat.)

1. The "Trifid" is a what?
- a. Galaxy
- b. Nebula
- c. Globular Cluster
- d. B-movie monster

2. What is the most distant object you can see with the naked eye?
- a. Pluto
- b. The Andromeda Galaxy
- c. Crab Nebula
- d. Isn't that against the law?

3. What are globular clusters?
- a. Space dust
- b. Twin asteroids
- c. Balls of closely packed stars
- d. Mom's Awful Cookies

4. Comet Halley is visible from Earth once every how many years?
- a. 52
- b. 24
- c. 76
- d. Hup, Hup, Hup

5. Galilean moons orbit which planet?
- a. Mercury
- b. Jupiter
- c. Hollywood

6. The sun travels through how many constellations in one year?
- a. 6
- b. 12
- c. 13
- d. The sun moves?

7. Where is M31?
- a. Andromeda
- b. Perseus
- c. Near Chicago

8. What is another name for the North Star?
- a. Polaris
- b. Sirus
- c. Celine Dion

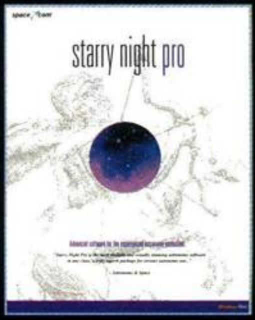
9. Which of the following isn't a nebula?
- a. Crab
- b. Veil
- c. Orion
- d. Moose

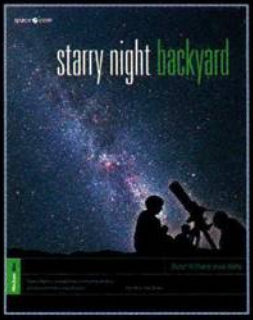
ANSWERS:
1(b), 2(b), 3(c), 4(c), 5(b) 6(c), 7(a), 8(a), 9(d)

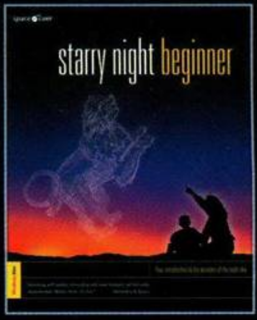
2

Let Starry Night™ be your guide.

© 2000. SPACE.com Canada, Inc. All Rights Reserved







starry night pro. Advanced software for the experienced astronomy enthusiast. Visually stunning, this CD has all the data you need to guide you to all the planets, stars, constellations and over 70,000 galaxies. Comes complete with a free 200 page guidebook to navigating the stars.

➤ Starry Night Pro $129.95

starry night backyard. Discover the Universe on your desktop. Sharing the same visual accuracy as Starry Night Pro, this CD will help you identify planets, stars and constellations using binoculars or the naked eye. Backyard (SE) also comes with the free 200 page guidebook.

➤ Starry Night Backyard $49.95 ➤ (SE) $59.95

starry night beginner. Your introduction to the wonders of the night sky. Starry Night Beginner conveys the invigorating experience of being out in the countryside standing under a canopy of stars on a still night. It's perfect for anyone learning their way around the night sky.

➤ Starry Night Beginner $29.95

3

Order now from www.StarryNight.com or call (800) 221-8180

Take an online tour at www.StarryNight.com/tour

Starry Night is now published by space.com™

new crown jewel: the Robert C. Byrd Green Bank Telescope (GBT). Rising 485 feet high and weighing 16 million pounds, the new telescope is the most sophisticated large single-dish radio telescope ever built. It replaces the 300-foot radio telescope at Green Bank that collapsed in a tangled mass of twisted metal back on November 15, 1988.

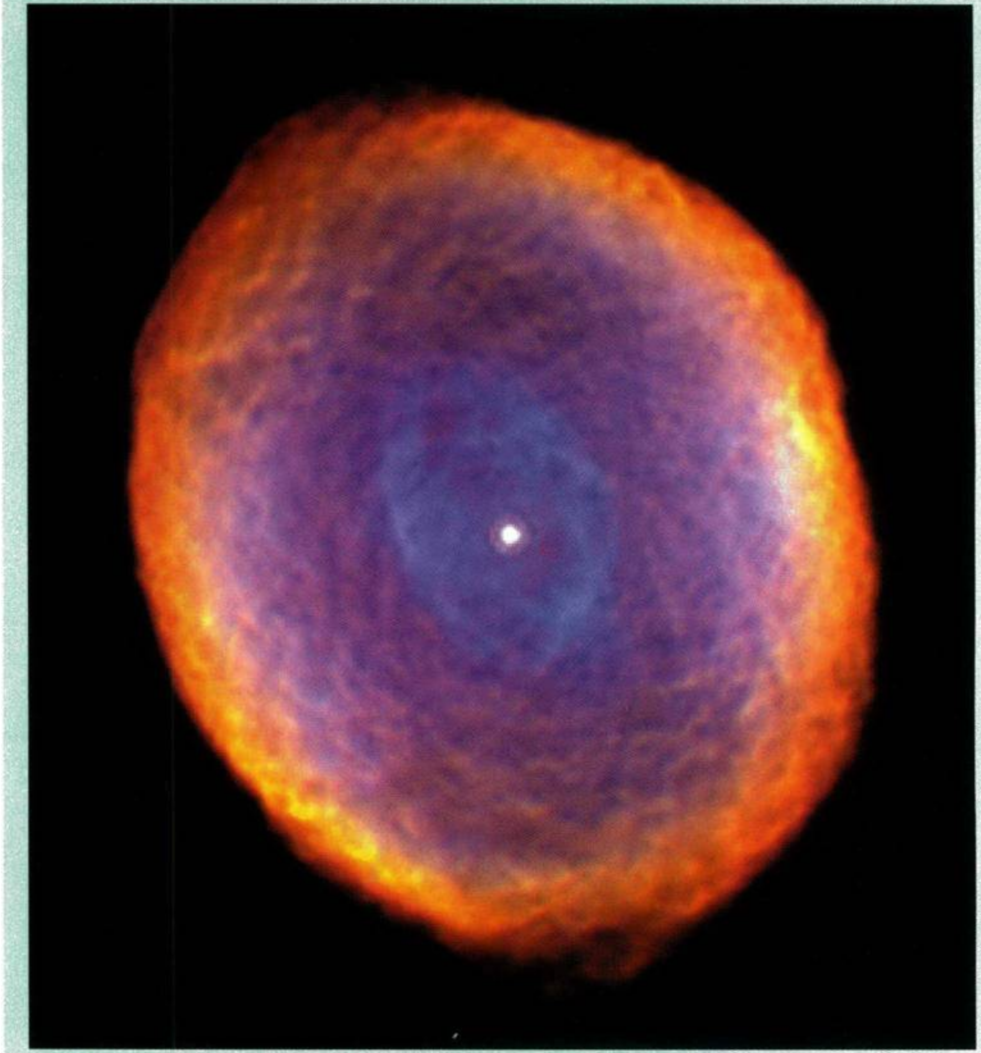
The GBT saw "first light" — or more appropriately recorded its first radio waves from space — at 7 P.M. on August 22, 2000, when it began to track the radio galaxy 1140+223 across the sky. It then locked on to the pulsar B1133+16 and recorded its telltale pattern of radio pulses, which reach Earth every 1.2 seconds. (A pulsar is a rotating neutron star that shines a beam of radio waves like a cosmic lighthouse; these radio signals sweep past Earth at regular intervals.) The GBT should begin regular scientific observations by early 2001.

The collecting area consists of 2,004 panels that cover nearly 2 acres. The panels can be adjusted individually by a system of 2,209 motor-driven pistons, or actuators, to an accuracy of 25 micrometers. The telescope's mount allows it to view any part of the sky above 5° elevation, giving it access to 85 percent of the celestial sphere. And the GBT will be able to observe at frequencies between about 100 megahertz and 100 gigahertz (corresponding to wavelengths between 3 meters and 3 millimeters).

These capabilities will allow the GBT to make the first routine observations of spectral lines in the youngest galaxies. It will also measure accurately the masses and distances to galaxies, yielding the best estimates yet of the expansion and age of the universe.

Closer to home, the GBT will hunt for pulsars, map magnetic fields throughout the galaxy, and study the chemistry of interstellar clouds and star-forming regions. It will even image the surfaces of planets and near-Earth asteroids by receiving reflected signals transmitted by other radio telescopes. Although it took the demise of another telescope to get the GBT started, astronomers stand to be the ultimate winners. — R. T.

HUBBLE SPACE TELESCOPE

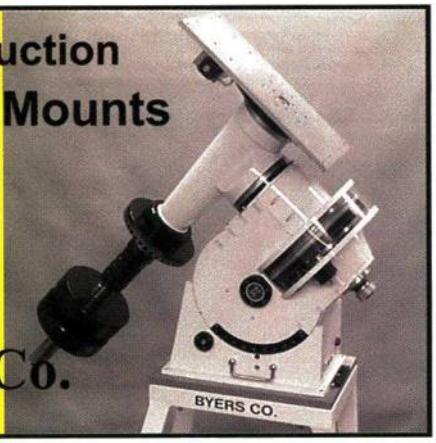


NASA and the Hubble Heritage Team (STScI/AURA)

GLOWING LIKE A MULTIFACETED JEWEL, the planetary nebula IC 418 comes to life in this recent Hubble image. The nebula, which lies about 2,000 light-years from Earth in the constellation Lepus, represents the final stage in the evolution of a star like the sun. The object seen at the center of IC 418 was a red giant star just a few thousand years ago, but then it puffed off its outer layers to form the nebula, which has since expanded to a diameter of about 0.1 light-year. The hot core of the red giant remains at the center of the nebula, slowly evolving to become a white dwarf. Ultraviolet radiation from the stellar remnant floods out into the surrounding gas, causing it to fluoresce. The remarkable patterns in the nebula were not seen before the Hubble observations and their origin remains a mystery. The nebula is destined to disperse gradually into space over the next several thousand years.

New Year 2000 production
BYERS Series II Mounts

**Research quality.
With analog circles
(as shown) or digital
position display. (See at
www.hardin-optical.com)**



Hardin Optical Co.

Call toll free: 1-877-447-4847

FOR THE LOWEST
PRICES & BEST SERVICES
TO ORDER CALL TOLL FREE
1-888-4ASTRONOMY
(1-888-427-8766)
Phone Orders: Mon through Sat. 9-6
Pacific Standard
Times

WOODLAND HILLS Camera

Telescopes • Electronics

5348 Topanga Canyon Blvd., Woodland Hills, CA 91364

TEL: 818-347-2270 • FAX: 818-992-4486

Stocking Dealer for:
CELESTRON • MEADE • TELE VUE • LOSMANDY • PENTAX • JMI

FULL LINE MEADE STOCKING DEALER

TELE VUE

Plossl-50°	
8-11, or 15	**$82**
20 or 25mm	**$95**
Panoptic-68°	
15mm	**$210**
19mm	**$240**
Nagler-82°	
4.8mm	**$175**
7mm	**$220**
Nagler type 4 12mm	**$370**
Nagler type 5 31mm	**$595**

SCOPESAVER

LX200 Scope Saver 11.5"x 20" **$98**
- A must for 10" LX owner
- Fits 7"-12" Meade scopes
- Hold 12 eyepieces! Holds keypad Securely

LOSMANDY

G11- Mount with dual access drive.
$1,895.00

GM-8 mount, dual access drive.
$1,399.00

JMI

Precision Fault-Free Focuser

NGFS	**$269.00**
Moto Focuser Non-vignetting adapter	**$45.00**

Wheeley Bars

Universal 8" or 10" SCT	**$159.95**
12" LX200	**$199.95**
Custom-Made	**$250.00**

PENTAX

65° Field

5.2 or 7mm	**$249**
10.5 or 14mm	**$239**
21mm	**$248**
28mm	**$238**

MEADE

Meade
7", 8", 10" & 12"
Dobs, Equatorials, SCT's & Refractors in stock.

GoTo
Telescope

We have the complete line of **Meade** CCD cameras in stock.

Meade ETX 90EC
with Electric Focuser
ON SPECIAL
Trade in year old ETX
to the new 90 or 125EC

ETX 60,70 IN STOCK STARTING AT $289⁰⁰

Meade DS 90 EC
Too low to print ....Call
Complete line of DS Telescopes in stock.
Full line of accessories in stock.

CELESTRON

C8 Deluxe	**Call**
CG11	**Call**
Ultima 2000	**Call**
G3 & G5 (With Motor)	**Call**
CR150 Refractor	**$799**

CELESTRON 1 1/4" EYEPIECES

ULTIMA EYEPIECES

5mm, 1 1/4"	**$69.95**	7.5	**$69.95**	12.5mm, 1 1/4"	**$69.95**
18mm, 24mm, 1 1/4"	**$79.95**	30mm, 1 1/4"	**$84.95**	35mm, 1 1/4"	**$99.95**
42mm 1 1/4"	**$99.95**	Ultima Barlow Short Tube Version			**$69.00**

PLOSSL EYEPIECES

6.3, 7.5,12.5, 10, 17, 1 1/4"	**$39.95**
32, 40mm, 1 1/4"	**$59.00**

Celestron C90 Rubber Armored 1 1/4" Eyepiece..... $355

The New NexStar 8 GoTo Telescopes by Celestron In stock........................ CALL

NexStar 8

ASC Graphics 8-16-99

TELRAD FINDER $39.95

Thousand Oaks Solar Filters (Mounted Glass)

8" Solar Filter	**Call**
10" Solar Filter	**Call**
12" Solar Filter	**Call**

FOR THE LOWEST
PRICES & BEST SERVICES
TO ORDER CALL TOLL FREE
1-888-4ASTRONOMY
(1-888-427-8766)
Phone Orders: Mon through Sat. 9-6
Pacific Standard
Times

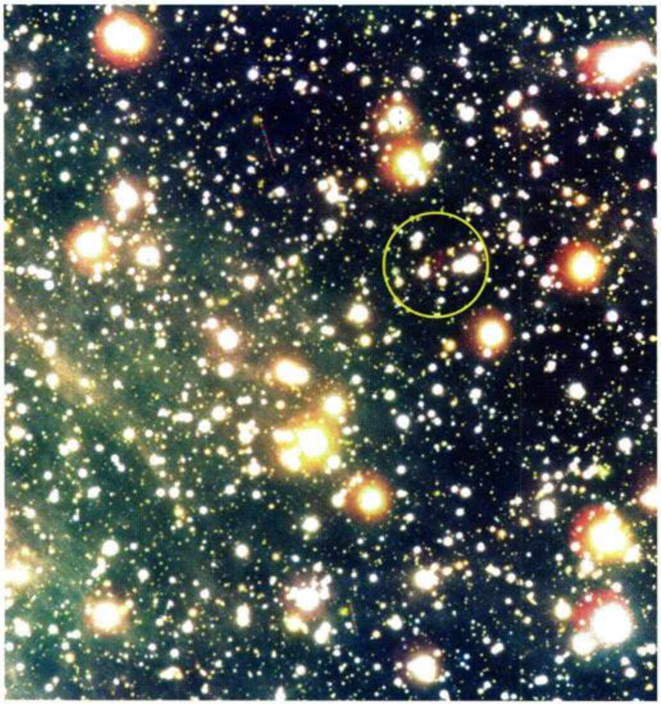
LET OUR FACTORY TRAINED EXPERT HELP YOU WITH YOUR TELESCOPES NEED CALL US
818-347-2270

MasterCard VISA AMERICAN EXPRESS Cards DISCOVER

WE SHIP ANYWHERE • VISIT OUR WEB SITE WWW.TELESCOPES. NET

Over 200 pages of
telescopes, eyepieces and resources.

www.StarSafaris.com



European Southern Observatory

A small, cone-shaped nebula (circle) contains hydrogen ready to smash into a neutron star.

GALACTIC ASTRONOMY

Loneliness of a Neutron Star

▶ Two hundred light-years away in Corona Australis, an old neutron star plows through interstellar space. Known as RX J1856.5–3754, it was discovered in 1992 by the ROSAT x-ray satellite.

When astronomers pointed Hubble at it four years later, they found an isolated object but no supernova remnant. Because neutron stars form from the collapsing cores of exploding stars, the lack of a remnant means the star must be at least 100,000 years old and should have cooled greatly since birth. Yet it remains a hot x-ray source, glowing at a temperature of 1.2 million degrees Fahrenheit (700,000° C).

Marten van Kerkwijk of the University of Utrecht in the Netherlands and Shri Kulkarni of the California Institute of Technology decided that this strange object deserved a closer look. Using one of the 8-meter mirrors of ESO's Very Large Telescope, they found that RX J1856.5–3754 had changed positions since Hubble observed it — moving at a rate of some 60 miles per second (100 km/sec).

They also found that the density of hydrogen gas in the star's vicinity is about 100 times the typical density of interstellar space. This gas shows up as a small, cone-shaped nebula that had never been seen before. (The neutron star is the very faint, blue object at the tip of the cone.) The researchers suggest that as the star rushes through space, its intense gravity will pull the hydrogen in. Hitting the surface at about half the speed of light, the gas could then be heating the star's surface. — R. T.

Campaign for the Science Vote

Let's face it, space policy isn't a make-or-break campaign issue. But it's more than just a passing concern for many Americans, including the 300,000 people who read *Astronomy* each month. That's why we have sifted through campaign archives to give you the latest on what presidential frontrunners George W. Bush and Al Gore promise to do for space exploration and astronomy research in America.

Left: RNC; right: DNC

Astronomy Research

Bush: Although George W. Bush has remained relatively quiet on the issue of research funding, the Republican platform states that, "We consider space science a national priority with virtually unlimited benefits, in areas ranging from medicine to micro-machinery."

Gore: Gore and Lieberman "believe that the federal government should make sustained increases in its overall R&D investment." They also plan to "create telescopes so powerful that they will allow us to see the planets of other solar systems and help us determine the origin, evolution, and destiny of the universe."

The Space Program

Bush: The Republicans plan to "remain committed to America's leadership in space research and exploration" and to "continue the exploration of Mars and the rest of the solar system."

Gore: "I am deeply committed to an aggressive, forward-looking space program — a space program that dares to push the limits of the heavens," explained the Vice President in a 1999 speech commemorating the 30th anniversary of Apollo 11. While Gore says, "There's no doubt that we will eventually land a human being on Mars," he doesn't think it makes sense to do it now.

Science Education

Bush: Under Bush's economic plan, college students who enroll in math and science courses could earn an additional $1 billion in grant aid over the next five years.

Gore: Gore also plans to increase aid for students pursuing careers in science and engineering and promises to "look at new ways to recruit, train, and support high-quality math and science teachers — so our children and grandchildren can look skyward with as much understanding as awe."

Boost your economics I.Q. in minutes a day...

With Professor Timothy Taylor's ECONOMICS course, a 20-lecture series offered on your choice of audio- or videocassettes by The Teaching Company®

What causes changes in the stock market, including the surge of the mid- and late 1990s? Do markets cause pollution and poverty, or are they a source of solutions to these problems? What implications do economic events abroad (turmoil in Asia, a common European currency) have for the U.S. economy? Does the minimum wage cause unemployment? Why do economists always disagree so much among themselves?

Questions like these are not an abstract academic concern. Far from it. They are the stuff of daily debate from Main Street to Wall Street, and they have enormous practical implications for your money, your life and, indeed, for all of us. If you work, save, invest, and pay taxes, a working knowledge of the fundamental principles of economics is something you simply *must* have.

Given the undeniable importance of economics, isn't it frustrating how reporters, commentators, and other "insider" types usually talk about it in a jargon-filled shorthand that can leave even the most intelligent layperson feeling utterly mystified?

Now , with the help of University of Minnesota professor Timothy Taylor and his Teaching Company course on **Economics**, you can banish that feeling forever. Even if you have no formal background in the subject, you'll find that Professor Taylor offers a clear, accessible, and memorable introduction to the subject. After spending a few weeks viewing or listening *for less than an hour a day,* you'll be able to analyze and discuss economic matters with confidence. You'll find yourself bringing key scholarly insights to bear on topics such as taxes, interest rates, investments, trade, budget deficits, inflation, monetary policy, and more.

Bringing You the Best in Teaching

When we first thought of creating this lecture series, we knew we would have to find a truly outstanding lecturer. Our demanding search criteria were based on teaching awards and independent student evaluations—the most reliable and objective indicators of teaching ability available. They led us to Professor Taylor.

He not only teaches economics at Minnesota, but also serves as managing editor of the *Journal of Economic Perspectives,* a leading review of new ideas in the field. When he taught at Stanford, his lectures achieved such renown that the university students' association honored him with its Award for Excellence in Teaching. In addition to **Economics**, his contributions to The Great Courses on Tape™ include **Contemporary Economic Issues**, **Legacies of Great Economists**, and **A History of the U.S. Economy in the 20th Century**.

The 20 lectures of **Economics,** each 45 minutes long, cover a wealth of topics in both micro- and macroeconomics, with an introductory lecture on how economists think, and a thought-provoking closing lecture on the need for a new starting point in our economic thinking.

To maximize your learning, the course comes with full lecture outlines, lists of study questions, and an annotated bibliography.

For greatest ease of comprehension, we recommend the video version, which uses numerous on-screen graphics and illustrations to support Professor Taylor's explanations of major economic concepts.

This is truly knowledge you can use. These tapes make learning easy, convenient, and fun. Call The Teaching Company and order **Economics** today.

"An efficient way for busy people to enhance their economic literacy."

DAVID S. DAHL,
PUBLIC AFFAIRS ECONOMIST
FEDERAL RESERVE BANK OF MINNEAPOLIS

LIFETIME SATISFACTION GUARANTEED!

Read what these customers have to say about Timothy Taylor on ECONOMICS:

"I never took any economics courses during my undergraduate training, but now I feel as if a whole new world has opened up for me. Professor Taylor...turned the dismal science into a dazzling science."
—Michael Grabowski, M.D., Seattle, WA

"Informative and thoroughly enjoyable!"
—Sophia Shockey, Pikeville, KY

"Very clear and poignant lectures by [Professor] Taylor."
—Mark Oetinger, Austin, TX

"The course has made driving much more enjoyable—and useful."
—Dale Carlson, Seattle, WA

"A force in adult education."
—THE NEW YORK TIMES

Shop securely on-line at www.teachco.com

THE COURSE CURRICULUM

PART I—Overview and Microeconomics

Lecture 1: How Economists Think
Lecture 2: The Fundamentals of Supply and Demand
Lecture 3: Reconciling Policy with Supply and Demand
Lecture 4: The Labor Market and Wages
Lecture 5: Interest Rates and the Demand Side of the Capital Market
Lecture 6: Financial Investment from the Supply Side
Lecture 7: The Environment and Negative Externalities
Lecture 8: Technology, Positive Externalities, and Public Goods
Lecture 9: Poverty and Inequality
Lecture 10: Regulation to Ensure Free Markets

PART II—Macroeconomics and Conclusion

Lecture 11: The Macroeconomics Perspective on Long-Term Growth
Lecture 12: Fighting Unemployment
Lecture 13: Why Inflation Matters
Lecture 14: A Sustainable Trade Balance
Lecture 15: The Federal Budget, the Deficit, and Fiscal Policy
Lecture 16: The Federal Reserve and Monetary Policy
Lecture 17: The Unemployment-Inflation Trade-off
Lecture 18: Trade Policy
Lecture 19: Exchange-Rate Policy
Lecture 20: A Global Economic Perspective

SALE PRICES!
OFFER EXPIRES DEC. 10, 2000

The Teaching Company®
7405 Alban Station Court, Suite A107
Springfield, VA 22150-2318

THE
Great Courses on Tape™
from the Business series...

To order, mail coupon below or call our toll-free number:
(Please refer to offer code 10597)
1-800-TEACH-12 (1-800-832-2412)
Or fax completed coupon to: **1-703-912-7756**

☐ VISA ☐ MasterCard ☐ ☐ DISCOVER NOVUS

Offer Code 10597

Please send me **Economics**, which consists of twenty 45-minute lectures on audio- or videocassette, with complete lecture outlines, and a suggested reading list.

(please check desired format)

FREE SHIPPING!

SALE ☐ Audio*: Entire two-part course $49.95 (reg. price $129.95) ~~plus $10 S&H~~.

SALE ☐ Video*: Entire two-part course $69.95 (reg. price $199.95) ~~plus $10 S&H~~.

**Note: Virginia residents please add 4.5% sales tax.*

☐ Check or Money Order enclosed

ACCOUNT NUMBER
SIGNATURE EXP. DATE
NAME (PLEASE PRINT)
MAILING ADDRESS
CITY/STATE/ZIP
PHONE *(If we have questions regarding your order)*

☐ **FREE CATALOG. Please send me a free copy of your current catalog (no purchase necessary).**

synctime metallic mesh band, metal bezel mineral lens, hi-tech polymer case $149.95

atomic radio with 2 alarms and tempature, day, date, LCD $39.95

NEW

Junghans atomic carbon, stainless bezel, sapphire lens LCD day date - carbon/leather band • $279.00

definitely atomic clock
definitely precise
definitely self setting

with the world's most accurate time pieces, atomic clocks & watches from

ATOMIC TIME ™

- watches for any time zone
- synchronized to the u.s. atomic clock in fort collins/co
- accurate to 1 second in 1 million years
- engineered in germany

complete line of atomic clocks
Junghans full ceramic or carbon fiber atomic watches in 12 styles, sapphire lens, bright lumi. hands for nighttime, waterresistant
Junghans solar watches
Junghans since 1861
over 100 different Atomic Time watches & clocks for home and office & weather stations

20% off second item

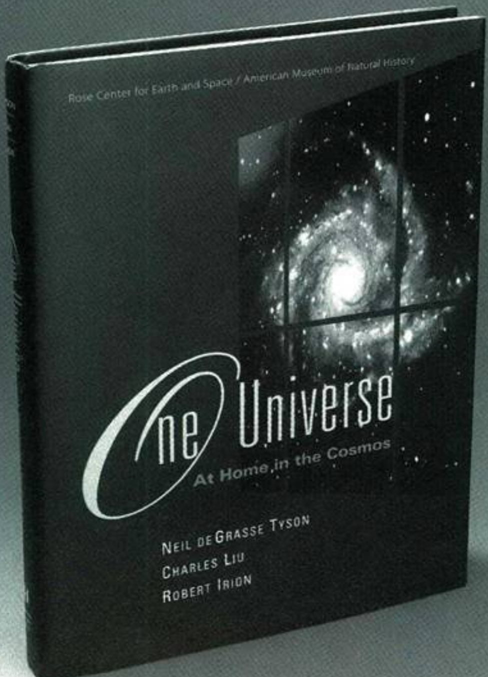
call for our free brochure:
or go to www.**atomictime.com**
credit card orders call toll free
1-800-985-8463
send checks/money orders for the total amount incl. s&h $6.95 to

ATOMIC TIME, INC.
1010 JORIE BLVD.
OAK BROOK, IL 60523

atomic dual alarm clock w. temperature day and date, black 3.5x4.5x2" $29.95

jumbo digit atomic clock w. temperature & day and date,wall or desk 8.5"x8.5"x1" • $49.95

black arabic 12" wall clock for home or office • $59.95 (wood $69.95)



One Universe
At Home in the Cosmos

Neil de Grasse Tyson
Charles Liu
Robert Irion

Published by
Joseph Henry Press
Washington DC
in conjunction with the
Rose Center for Earth and Space
American Museum of Natural History

ISBN 0-309-06488-0
224 pages. More than 200 full-color photographs and original illustrations.
$40.00

www.jhpress.org
Available at bookstores everywhere.

The vastness and the mystery of the universe brought down to Earth.

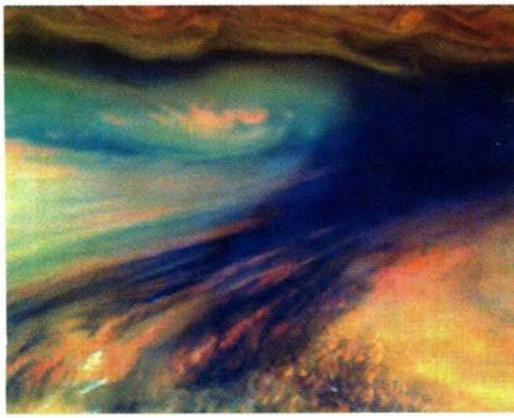
GALILEO PROBE

Holes Dig Deep into Jupiter's Atmosphere

▶ When the Galileo probe plunged into Jupiter's atmosphere on December 7, 1995, it found a planet significantly different from scientists' expectations. Perhaps most surprisingly, the entry site consisted of only thin clouds and contained no water — which Voyager measurements and the Comet Shoemaker-Levy 9 impacts both indicated were there.

Scientists soon realized that the probe entered a hot spot, one of many clear, dry areas that exist near Jupiter's equator. On a planet mostly wrapped in high clouds, the probe hit the southern rim of one of these clear spots where infrared energy from Jupiter's interior shines through. Planetary scientists have spent much of the past five years analyzing the probe's data and trying to understand how these hot spots persist for long periods.

The wait may now be over. Adam Showman of NASA's Ames Research Center and Timothy Dowling of the University of Louisville propose in the September 8, 2000, issue of *Science* that air moving west to east just north of Jupiter's equator is also moving dramatically up and down every few days. Water and ammonia vapors condense into clouds in Jupiter's white equatorial plumes as the vapors rise.



This false-color image of a hot spot depicts high and thin clouds as bluish, high and thick clouds as whitish, and low clouds as reddish. NASA/JPL

Then the wrung-out air falls, forming the clear patches. After crossing those hot spots, the air rises again and returns to its normal cloudy state.

The researchers developed a computer simulation that starts with a large-scale pressure difference and then recreates the known characteristics of the hot spots and plumes. Dowling said smaller pressure differences do not produce stable patterns. "There are no wimpy hot spots, only strong ones," he quips.

The computer simulation reveals that the probe's entry site was even more unusual than thought. Both the probe and the computer model show that the head winds on the southern rim of a hot spot get stronger and stronger as you head deeper into the planet. But in the model, this trend reverses on the northern rim. "These results underscore the importance of future multiprobe missions to Jupiter," says Dowling.

Each hot spot covers an area about the size of North America and lasts for months, yet combined they cover less than 1 percent of Jupiter's area. The term may be a bit misleading, however, because the temperature rises to only about 32° Fahrenheit (0° C). Still, that's downright balmy compared with the surrounding cloud tops, which come in at around –200° F (–130° C).

"This helps answer one of the big puzzles we ended up with after the probe entry," says Torrence Johnson, Galileo project scientist at NASA's Jet Propulsion Laboratory. He notes that the hot spots in some ways resemble subtropical deserts on Earth but, unlike Earth, Jupiter has no solid surface to stop the air's fall. — R. T. ■

*astro*GRAPHICS Science and nature publishing.

NEW! Hubble Space Telescope Gallery Prints

Choose from dozens of your favorite Hubble Space Telescope images on our online gallery. Each reproduced in large 20 x 20 inch photographic format on premium paper. Available framed or unframed. Excellent gift idea. We carry posters and calendars too!
ORDER ONLINE: www.*astro*graphics.com or call toll free 1-888-8-ASTRO-8

A NEW AND UNPRECEDENTED RESOURCE

Encyclopedia of ASTRONOMY & ASTROPHYSICS

Consisting of more than 2.5 million words, this important new reference resource offers:

- Articles written by over **800** renowned **international contributors.**
- More than **2,750 entries**—each article is signed by its author and followed by a **selected bibliography.**
- **Every entry has been commissioned** specifically for this *Encyclopedia.*
- Over **3,500 illustrations,** plus an **8-page section of color plates** in each volume.
- Extensive **cross-references** help users broaden or narrow their search.
- **14,000+ entries in the Name and Subject Index** help pinpoint information quickly.

AVAILABLE IN PRINT AND ONLINE

A subscription to this extraordinary resource offers convenient Web access to the entire text of the *Encyclopedia* plus powerful search capabilities, and these special features:

- Patron-friendly online access to the **full text, illustrations,** and bibliographic citations.
- **Search by keyword** or article heading, **browse** A-Z or by subject, or search the **14,000+ term index.**
- **Boolean, free-text,** and **concept search** capabilities.
- **Links** to the primary literature and to important sites and image banks.
- **Hyperlinked cross-references** between articles.
- **Quarterly updates** including additions of new material.

"The **Encyclopedia of Astronomy & Astrophysics** is profound, a rock for us science writers to anchor to as we report new discoveries and scramble for background information. Such a resource will only become more valuable as the pace of fathoming the universe accelerates. This encyclopedia will always be within my arm's reach."

—LEIF J. ROBINSON
Editor-in-Chief, *Sky & Telescope*

Print Set: 4 volumes • 2,500 pages • 3,500 illustrations
ISBN: 1-56159-268-4
$650

ONLINE ACCESS: contact your Grove's representative for details, or visit
www.ency-astro.com

GROVE Institute *of* **Physics** PUBLISHING nature publishing group
www.grovereference.com

Don't get Eclipsed off Santa's List!

Add *The Eclipser*, safe solar glasses, to the top of your Christmas list! On Dec. 25, 2000, a partial solar eclipse will be visible throughout North America and Canada. The only safe way to view solar eclipses is with Eclipsers safe solar glasses from American Paper Optics. **CE certified**, independently tested, and safe for direct solar viewing. Eclipsers are manufactured exclusively with *Solar Skreen®* lenses developed by astronomer Roger Tuthill. American Paper Optics has sold over 10,000,000 Eclipsers throughout the world over the last ten years.

Christmas Eclipse
Dec. 25, 2000

Eclipsers, colorfully printed with our commemorative Christmas design, are great stocking stuffers for clubs, enthusiasts, and organizations. Eclipsers are a spectacular retail sales item for science centers, museums, and planetariums. Custom-printed designs are also available for promotional use--call us for a quote! **Order Christmas Eclipsers today!** ***50 pairs @ $.79 each plus shipping***. Place your order three convenient ways: via our toll-free line at *(800)767-8427*, by fax at *(901)381-1517*, or email your order to *sales@3dglassesonline.com*.

American Paper Optics, the world's leading manufacturer of paper 3D glasses, offers an amazing assortment of 3D optics including the anaglyphic glasses featured in this issue of Astronomy magazine as well as diffraction glasses and our exclusive line of ChromaDepth® and HoloSpex™ glasses. For further info and samples of our 3D glasses contact:

VISA
MasterCard
AMERICAN EXPRESS

AMERICAN PAPER OPTICS INC
3080 BARTLETT CORPORATE DRIVE
BARTLETT, TENNESSEE USA 38133
www.3dglassesonline.com

1-800-767-8427 • 901-381-1515 • FAX 901-381-1517

Astronomy® wants to thank our 3-D sponsors!

astronomics
www.astronomics.com
(see our ad on pages 114-115)

AMERICAN PAPER OPTICS INC.
www.3dglassesonline.com

Astronomy.com
www.astronomy.com

Visit these websites for more wonderful 3-D images

Into Another Dimension

Use the 3-D glasses bound into this magazine to explore the third dimension of Earth, Mars, stars and constellations, and deep-space delights.

Every day we walk outside and see a three-dimensional universe, with trees, mountains, stoplights, and buses. Yet beset by the frailties of human vision, we don't always appreciate the three-dimensionality of the deeper universe. Gazing into the night sky approximates seeing a distant sphere with twinkling lights and fuzzy blobs created by perforations through a two-dimensional fabric. Limited by physics itself, the images presented in magazines such as *Astronomy* offer what is in effect a 2-D show put down with ink on paper.

But of course to appreciate the three-dimensionality of the universe's objects on paper, we need to simulate it. The cover photo showing the martian north polar ice cap and the above image of the coastline of Owahanga, New Zealand, are NASA products created with planetary data and generated to simulate a "flyover" view. They require no special glasses to appreciate. The following 27 images, presented in three special articles, are red-blue anaglyphs that require the glasses bound within to view successfully.

Astronomy thanks the organization who brought you the glasses: Astronomics. The glasses' producer, American Paper Optics, worked enthusiastically. Be sure to keep your glasses handy so that you can easily view the occasional anaglyph images we'll publish in the coming year. And check the additional 3-D images on the web and the story of how they were created at www.astronomy.com. Enjoy!

3-D EXTRAVAGANZA

Back to Mars

Mars Pathfinder enjoyed its moment in the martian sun, beaming back data for 84 days during the summer and fall of 1997. Cold temperatures eventually sapped the lander's batteries, silencing future signals. But for planetary scientists on the Mars Pathfinder team, their work was just getting started. They continue to pore over the treasure trove of images and data from the lander and its plucky Sojourner rover.

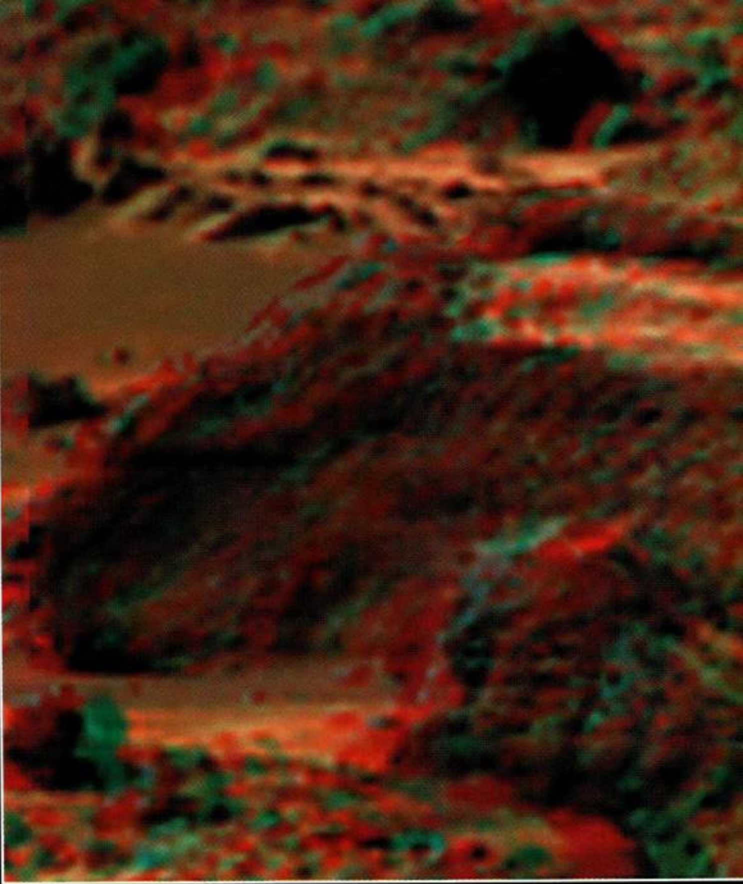
Geologist Tim Parker of the Jet Propulsion Laboratory played an instrumental role in this effort. Using modern computer processing, Parker created three-dimensional images that closely duplicate what a human being would see if standing in Pathfinder's place at Ares Vallis. Parker was going for more than just the gee-whiz effect. "These images were created by a scientist for science," says Mars Pathfinder project scientist Matt Golombek.

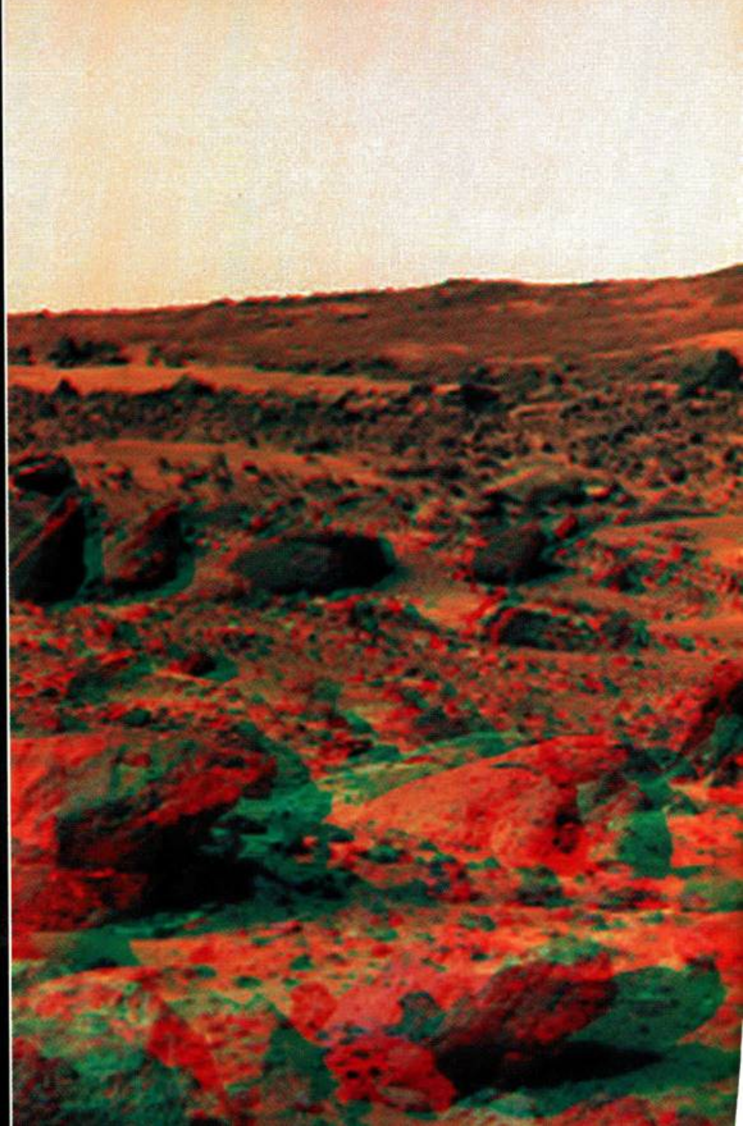
Because Pathfinder's imager had two cameras 6 inches (15 cm) apart, they took images from slightly different perspectives. By assigning the color red to one camera and blue to the other, Parker generated these 3-D anaglyphs. In essence, Pathfinder acquired depth perception in the same way humans do. The imager also took pictures from different positions on a 30-inch (0.8-meter) vertical mast. By combining these various images, the Pathfinder team could triangulate rock distances to generate an accurate topographic map of the area. This in turn allowed the scientists to analyze the distribution of rock sizes at the site.

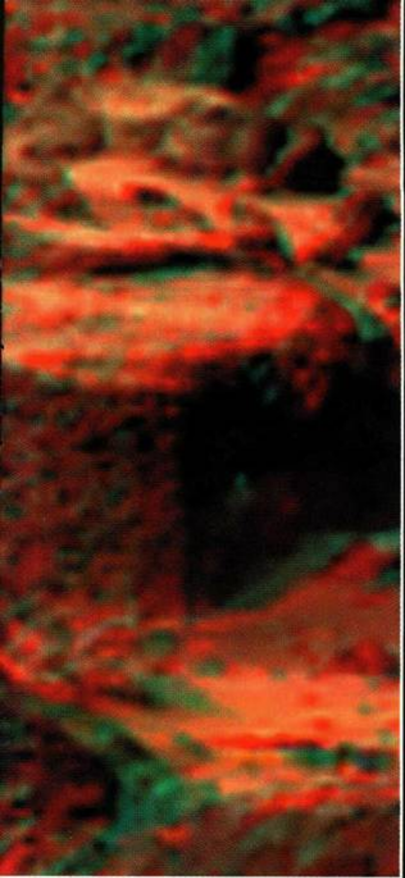
Taking pictures from two cameras also allowed Parker to combine photos into "superresolution" images. The "super" in superresolution means these images have sharper resolution than could be achieved using either camera alone. "Parker resolved pebbles in some of these deposits. You can't move pebbles in the air. This suggests that what you see at that site was deposited in a flood," says Golombek.

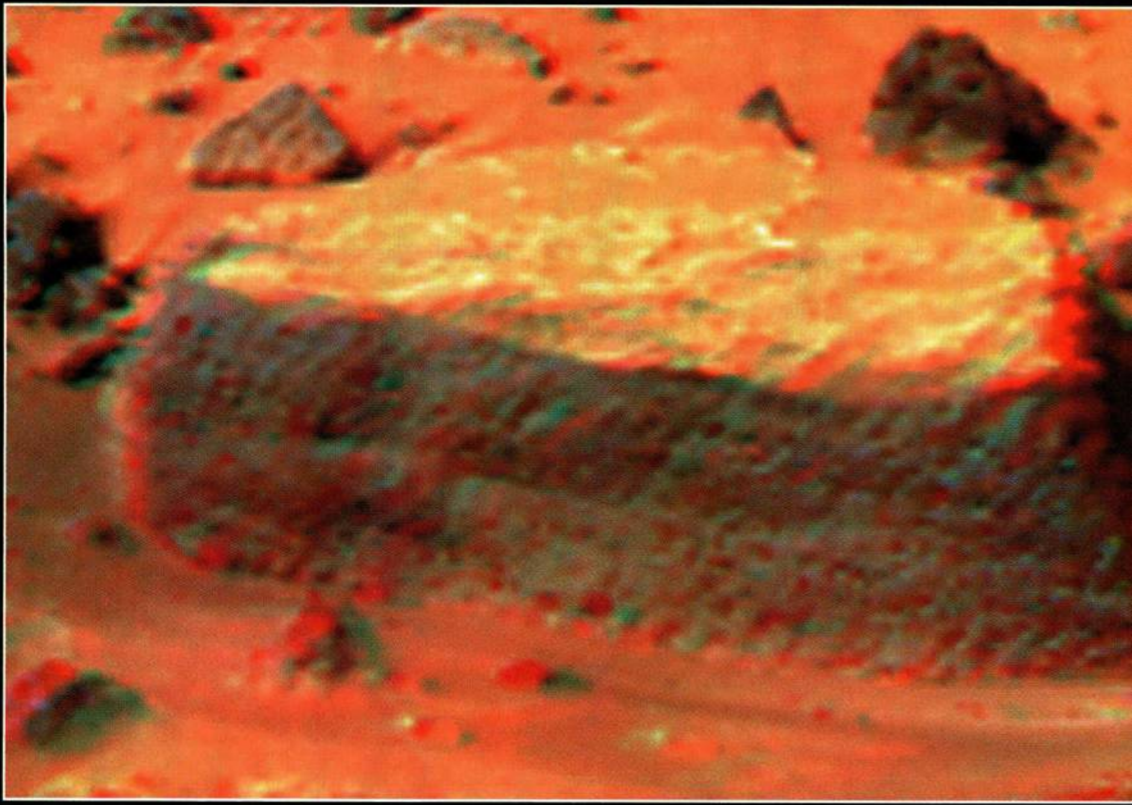
Based on the density of craters in the area, the team thinks the massive flood rolled through Ares Vallis 2 billion to 3.5 billion years ago. But since then, not much has happened. "The site is incredibly pristine. It looks the way we think it looked when the material was deposited," says Golombek.

— Robert Naeye









Chimp and Sandworm

The last martian rock studied before NASA lost contact with the Sojourner rover in 1997, "Chimp" (top left) appears to be covered with a rough, dark crust in some areas and a light, smoother material elsewhere. The pits on Chimp's surface may have formed as gas bubbles froze when the rock solidified or as a result of chemical etching and surface weathering. Chimp's neighbor "Sandworm" stands in the foreground.

Flat Top

Characteristic of many tabular martian rocks, "Flat Top" (above) dominates its immediate surroundings. The surface of Flat Top is covered with dust while its steep, weathered sides remain relatively clean. Frequent dust storms are likely responsible for the deposit of dust.

South Peak

Rising some 150 feet (46 meters) above the martian surface, scientists quickly recognized "South Peak" (left) from Viking photos. South Peak and its neighbor, "North Peak," enabled researchers to pinpoint Pathfinder's touchdown location.

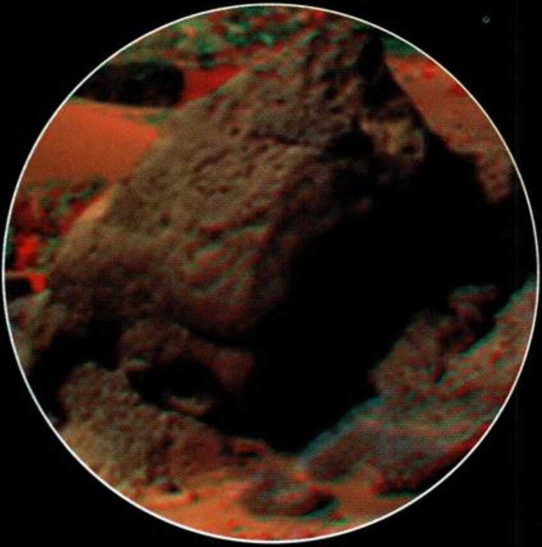
All Images: NASA/JPL/Tim Parker

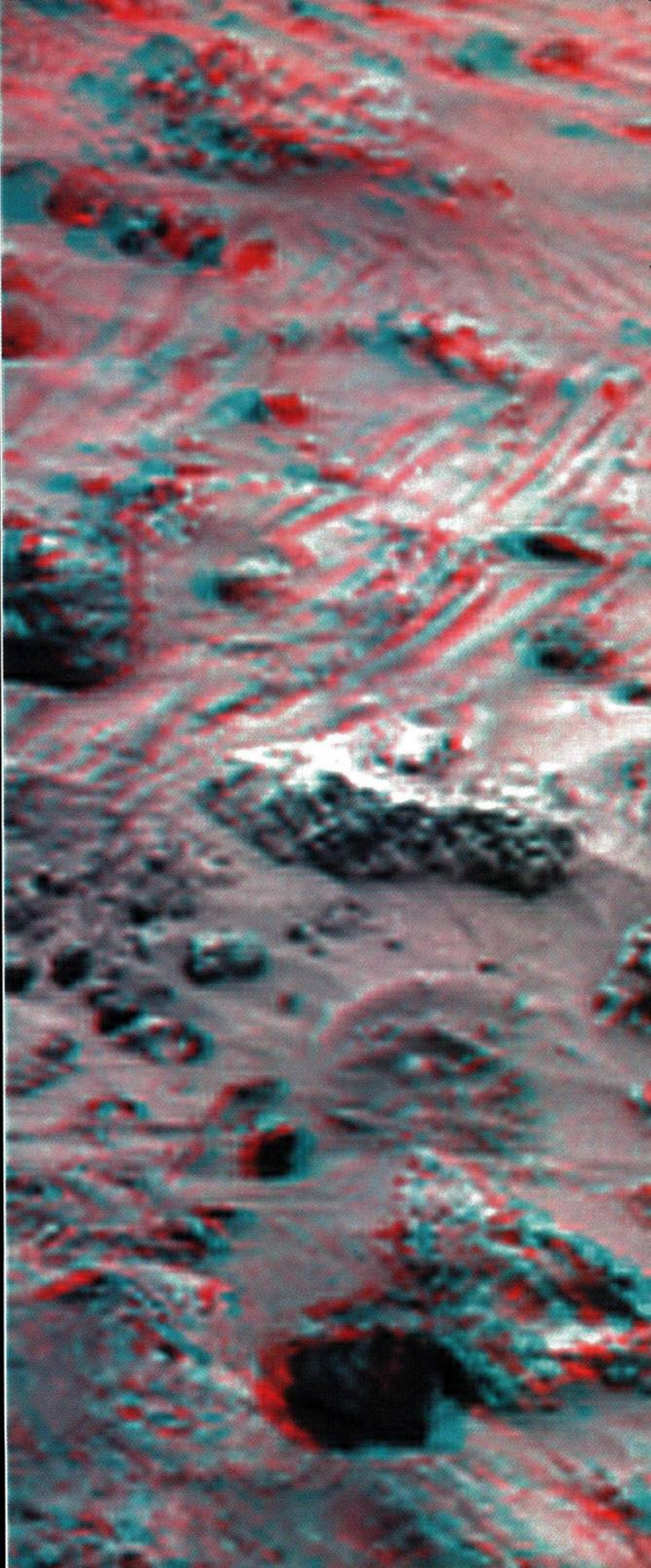
Mini-Matterhorn

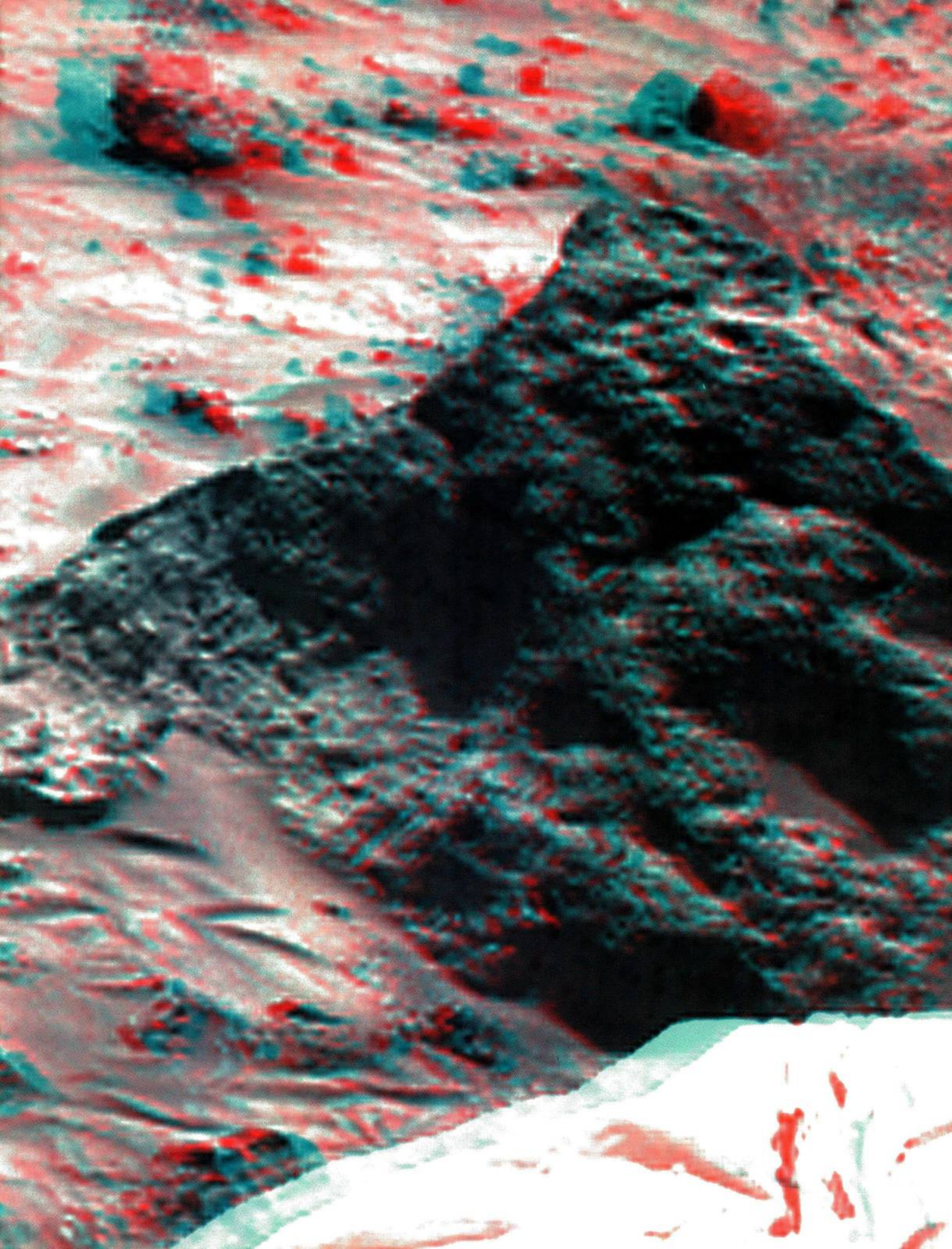
Challenging the bantam, 1-foot (30-cm) tall Sojourner rover with its nearly 2.5-foot (76-cm) slope, "Mini-Matterhorn" (right) borders the Pathfinder landing site. The white material at the bottom right of the image is part of the airbag system deployed on landing. Pathfinder images show that rocks larger than about 1.5 feet (46 cm) frequently display flat or sloped faces.

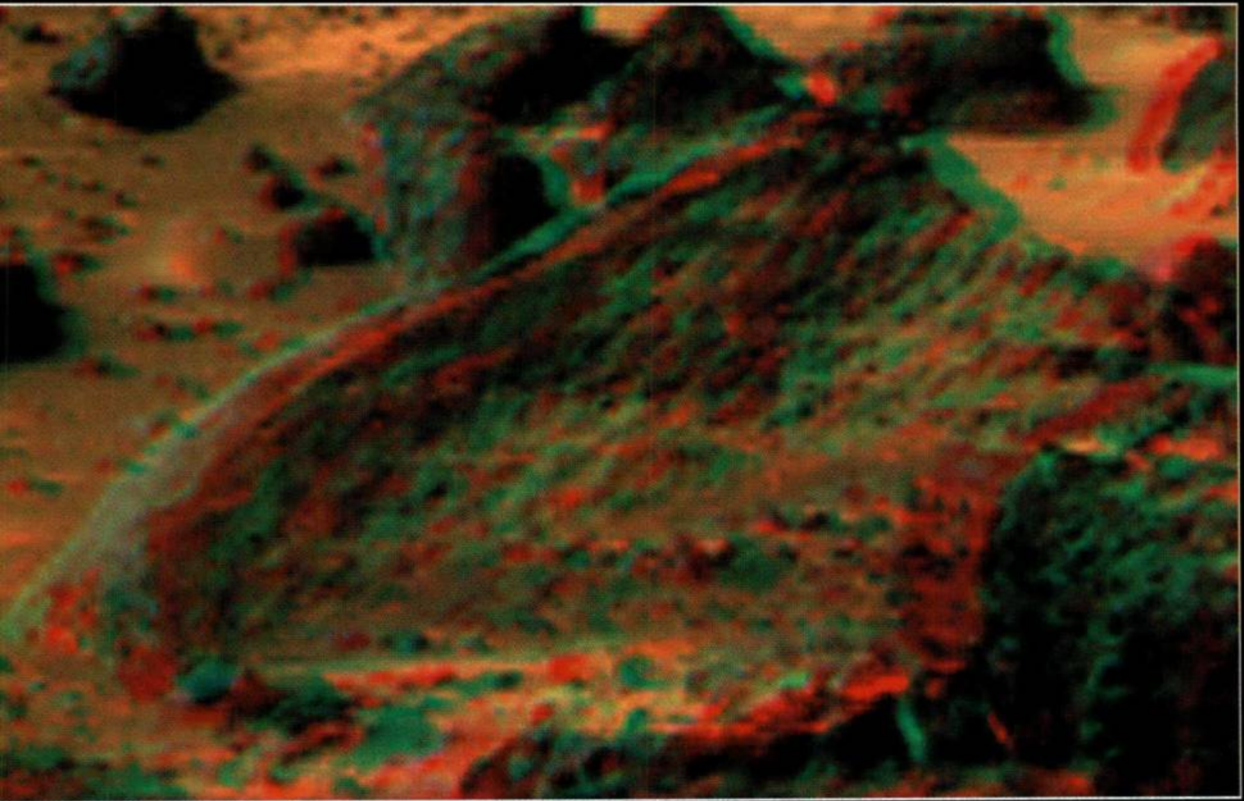
Shark

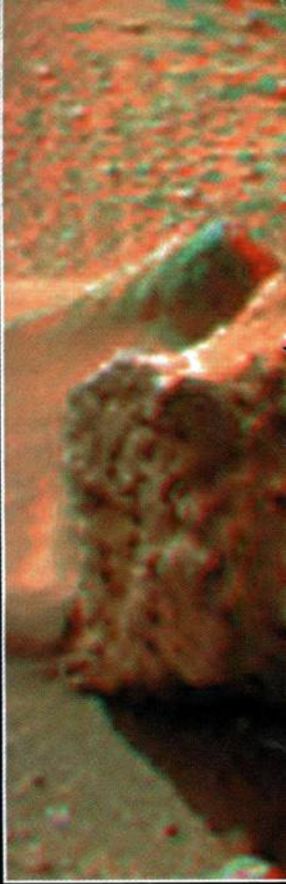
Catching the attention of Pathfinder scientists because of its smooth, dust-free surface, "Shark" (below) was an ideal target for the rover's x-ray spectrometer. Scientists believe that such angled rocks may have been displaced by a large flood that swept through the Ares Vallis region in Mars's distant past.









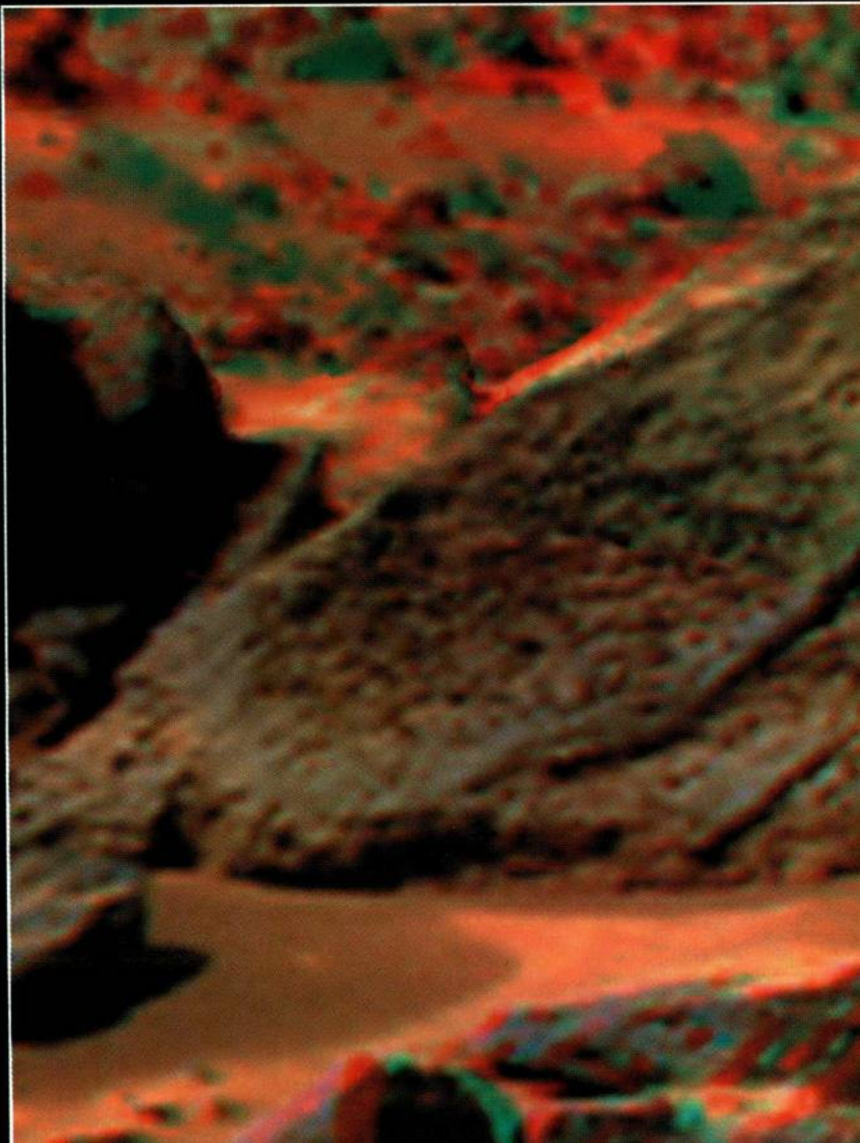


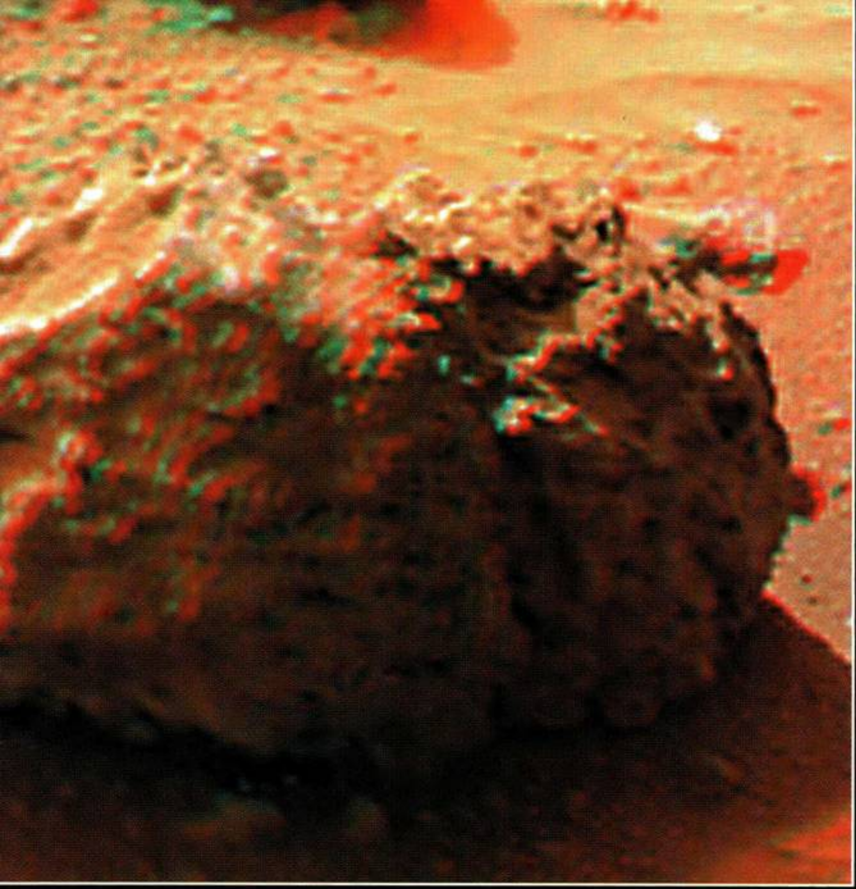
Ender

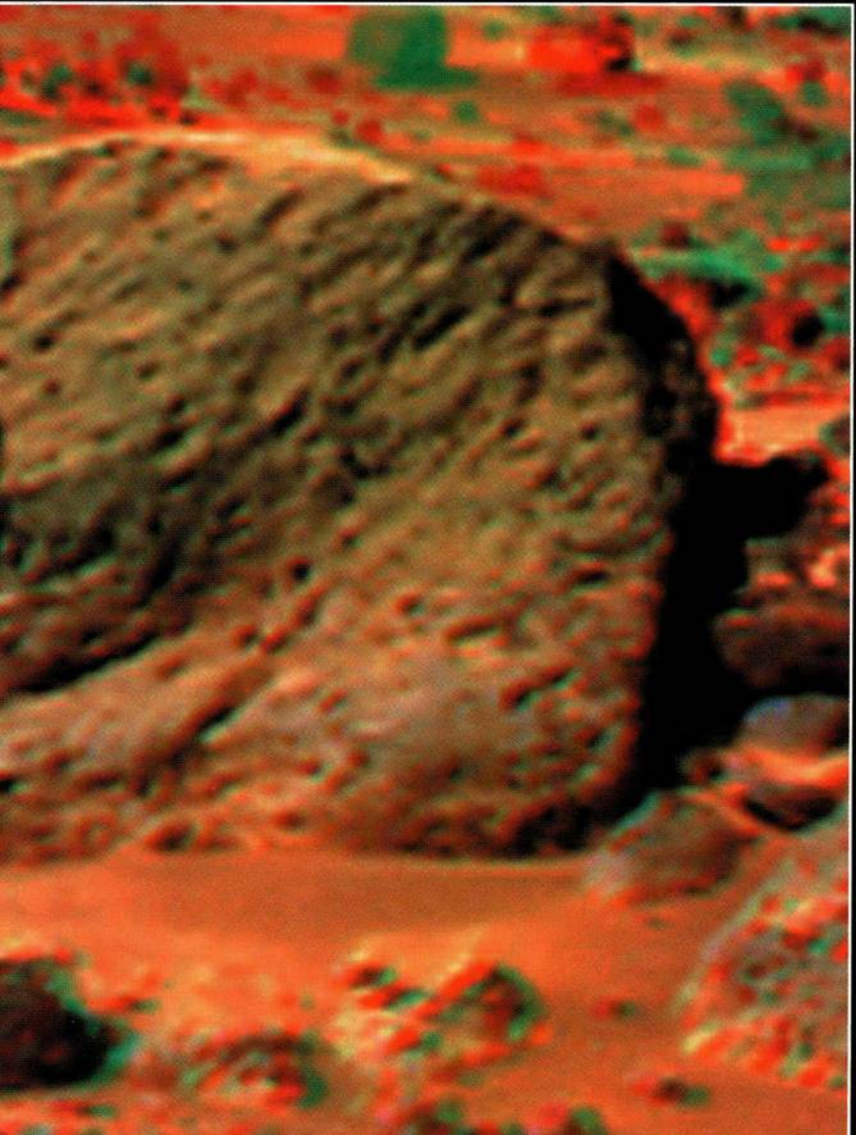
Pitted and worn, "Ender" (above) displays curious linear features near its edges. Like Chimp, Ender appears to be covered by a dark, crusty exoskeleton. The lighter material scattered throughout the face of the rock is likely wind-deposited dust.

Half Dome

Displaying prominent pits and puzzling wormlike linear textures along its weathered face, "Half Dome" (right) belongs to a group of objects located immediately southwest of the Pathfinder landing site nicknamed the "Rock Garden." The orientation and positions of these rocks suggest that they were probably ferried to their current location by rapidly flowing water several billion years ago.





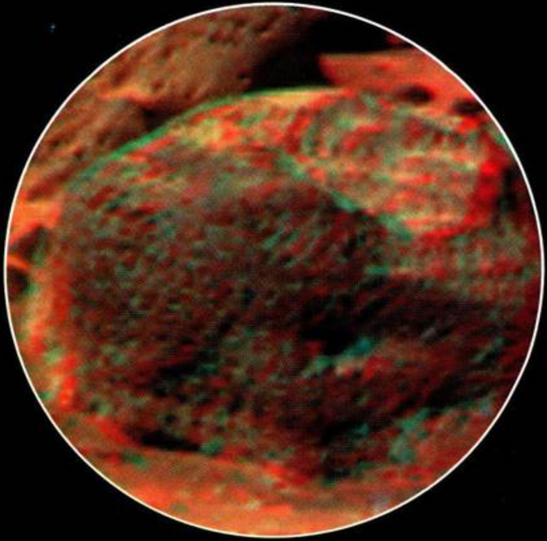


Barnacle Bill

The first target for the Sojourner rover's x-ray spectrometer, "Barnacle Bill" (left) is unusually rich in silicon, which places the 10-inch (25-cm) miniboulder amongst a group of volcanic rocks called "andesites." Andesites are Earth's second most common variety of volcanic rock.

Stimpy

Pits, fractures, and grooves on the surface of "Stimpy" (below) betray the rock's weathered past. The rather large craterlike depression near the top of the rock may be the result of a collision with debris thrown from a nearby meteoroid impact.



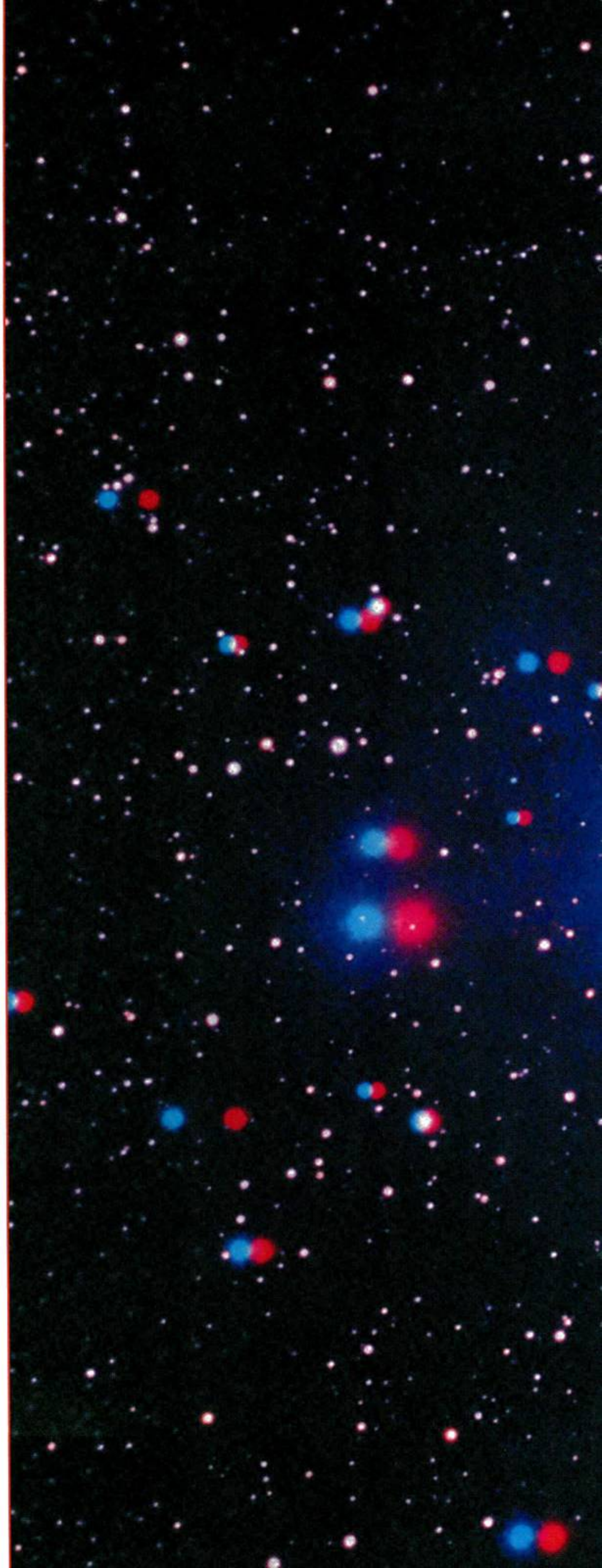
3-D EXTRAVAGANZA

Seeing the Depths of the Universe

Photographs by Akira Inaka

We publish the most beautiful and recent images from professional observatories and amateur astrophotographers. Many of our readers buy the magazine for the pictures just as much as the stories. But there is something lacking in those fabulous space shots — the third dimension. Comets, meteors, clusters, nebulae, and galaxies all appear static due to the confines of the two-dimensional medium in which we work. But through excellent photography and creative computer imaging, it is possible to produce eye-popping images. On the following pages these remarkable images show what it would be like to venture out into space and see real-life views as we see ordinary objects around us: A comet within our solar system jumps from the outlying stars; a meteor shower rains down on Earth; the dark Horsehead Nebula looms in front of a more distant nebulous glow. ■

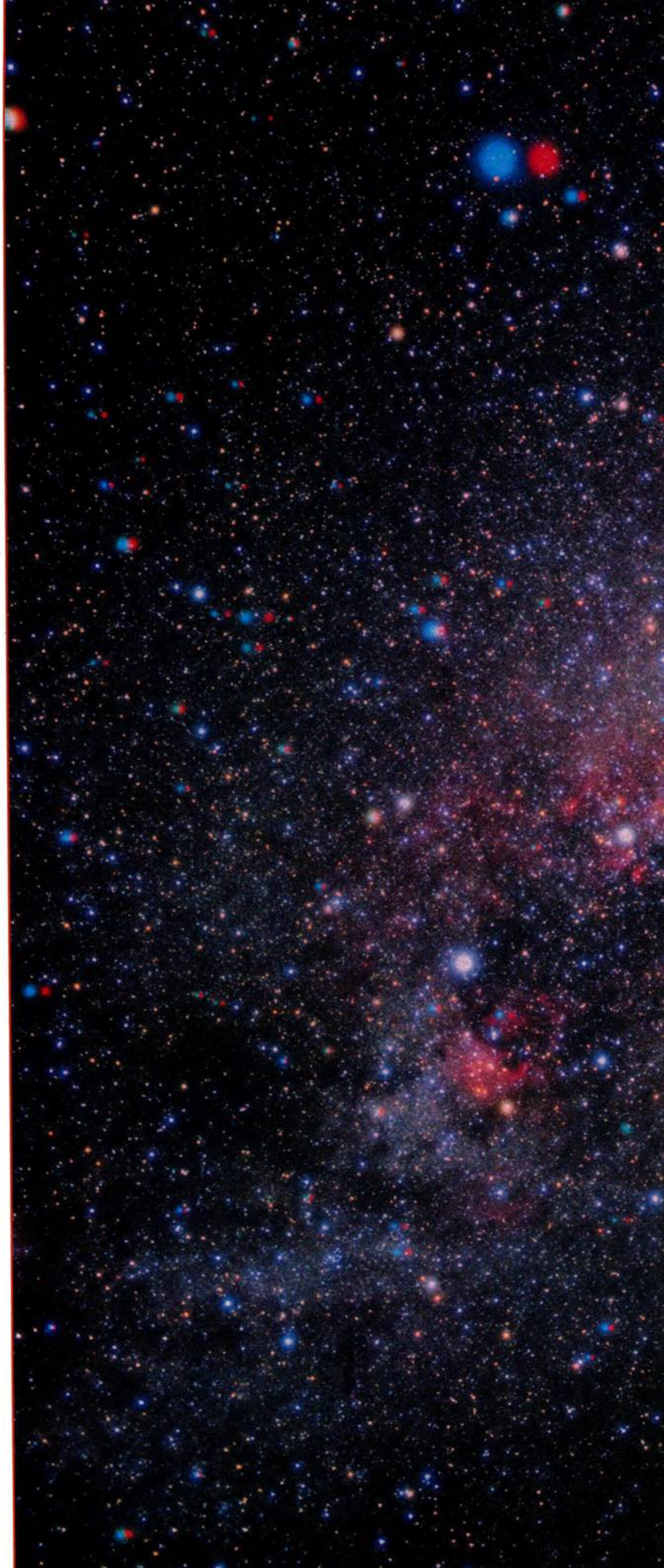
— Kelly Kizer Whitt



Pleiades Star Cluster

The Pleiades, or Seven Sisters, lies 410 light-years from Earth. The dusty environs are not an original part of the cluster but just a region through which the cluster is passing.

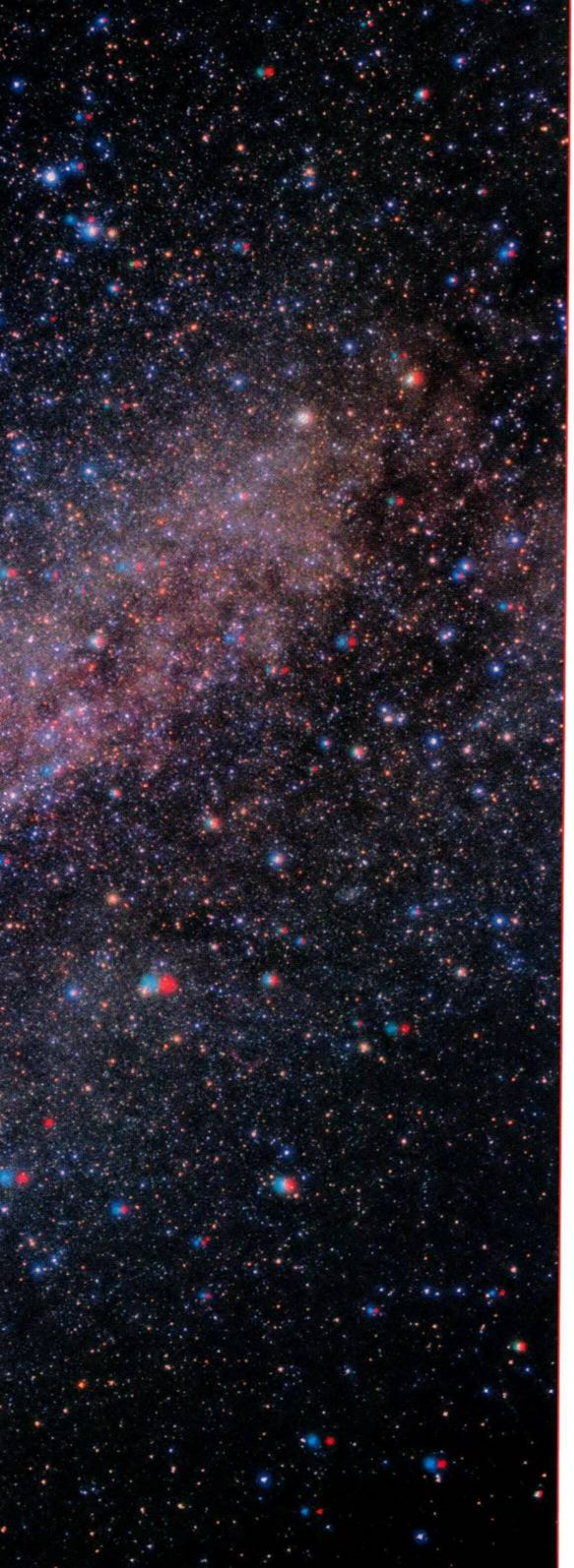
Above: Leonid Meteor Storm
A popular meteor shower that occurs every November around the 17th, the Leonids have been particularly active over the last few years. Meteors are the flashes of light that result when small bits of rock and dust enter our atmosphere.

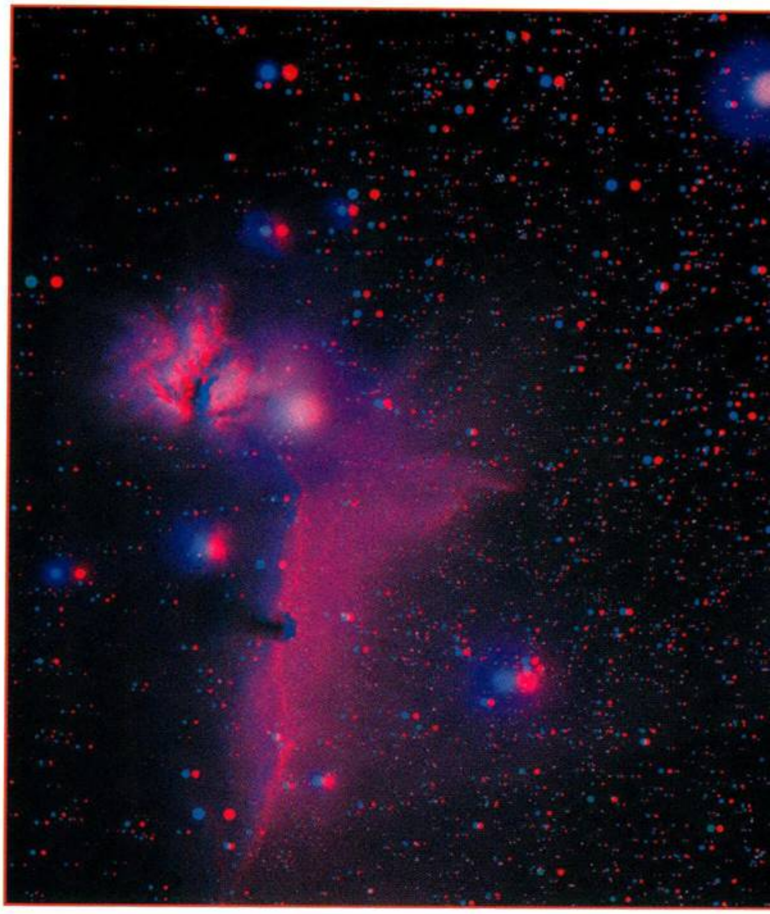


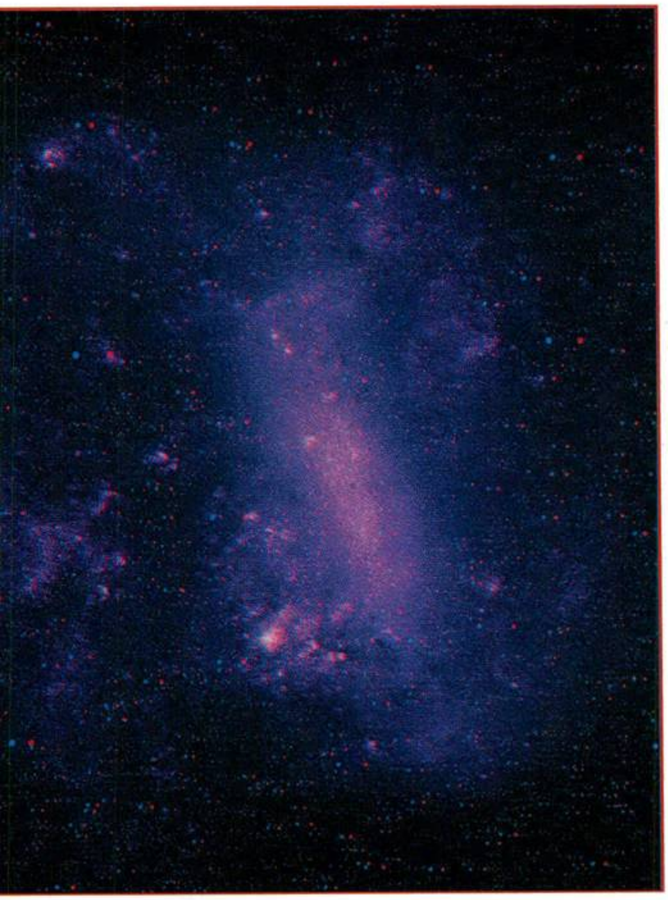
Right: Cygnus and Lyra in the Milky Way
Bright Vega soars out from the confines of its constellation, Lyra, because it lies just 25 light-years from Earth. Deneb, the brightest star in neighboring Cygnus, lies 60 times farther away. Inaka researched the distances to all stars brighter than 6th magnitude and less than 1,000 light-years away to create this image.

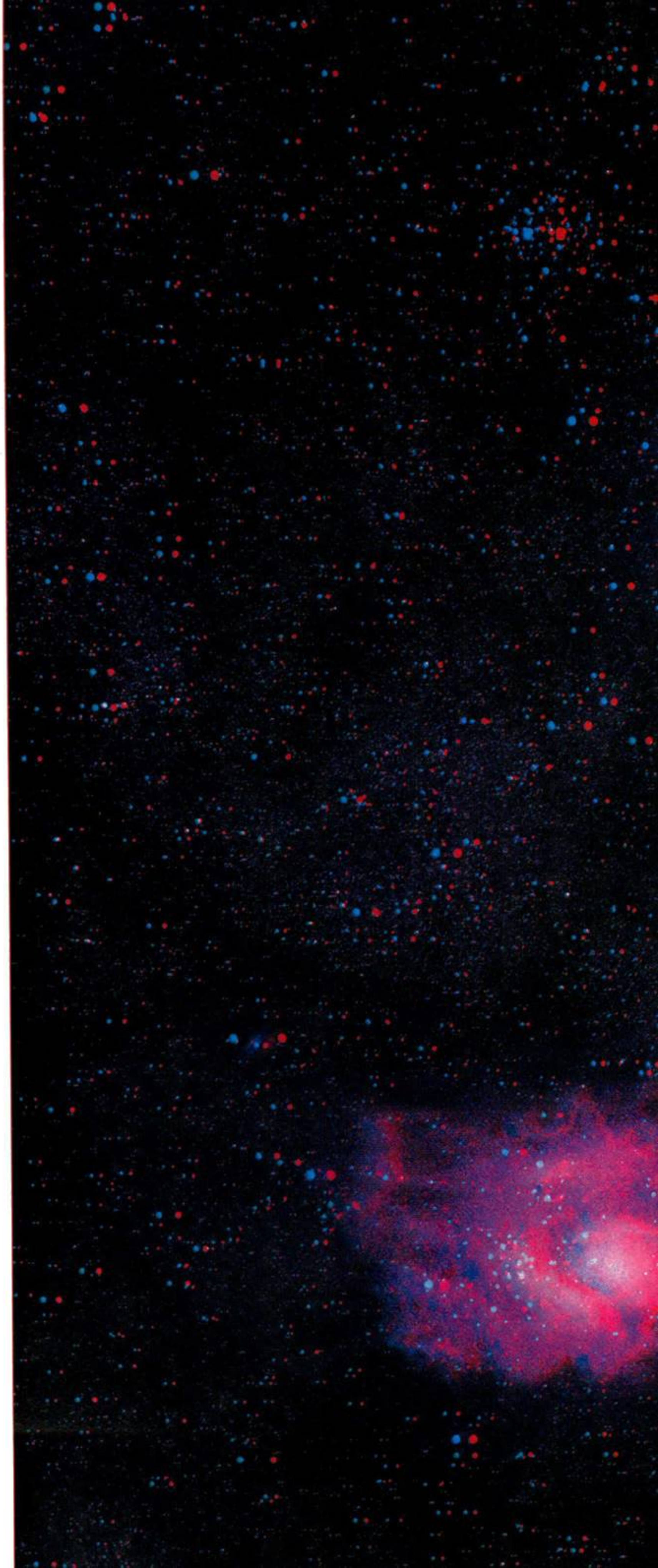
Upper right: Comet Hale-Bopp
The ion and dust tails from Comet Hale-Bopp took slightly different paths on their orbit around the sun. Hale-Bopp entered into the inner solar system, *coming much closer* to us than the Milky Way stars seen in the background.

Lower right: Horsehead Nebula and IC 434
The Horsehead Nebula is a dark nebula cataloged as Barnard 33. About 6' long, it projects onto the bright nebula IC 434. The star Zeta Orionis, or Alnitak, floats above and beside the Flame Nebula, NGC 2024.







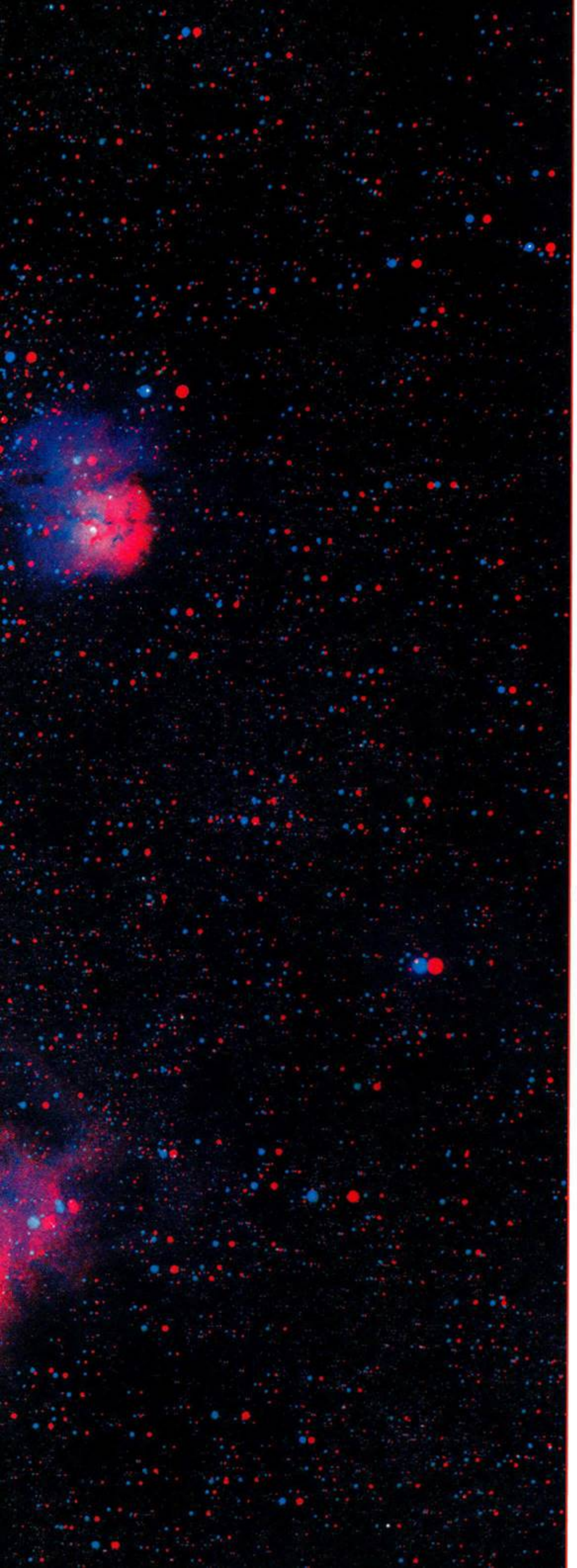


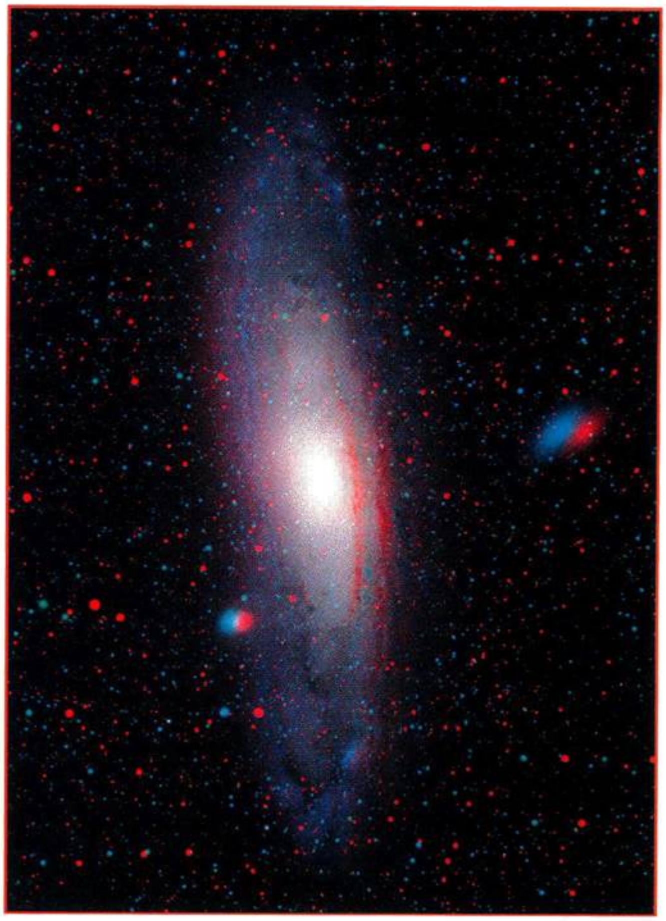
Above: Large Magellanic Cloud
The stars of our galaxy swim in front of the more distant Large Magellanic Cloud (LMC), a satellite galaxy that is visible to the naked eye from the Southern Hemisphere.

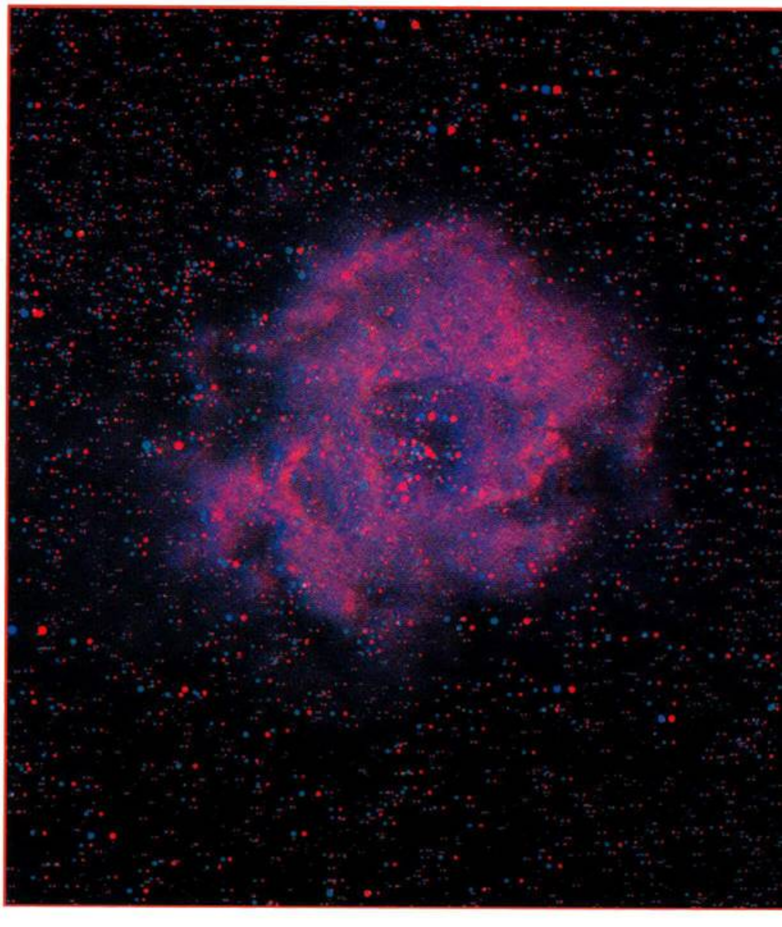
Right: M8, M20, and M21
Two popular nebulae, the Lagoon and bicolored Trifid, keep close quarters in Sagittarius. The star cluster M21 sits even closer to the Trifid. Sources disagree as to whether the cluster is slightly nearer or farther than the nebulae. The former approximation is pictured here.

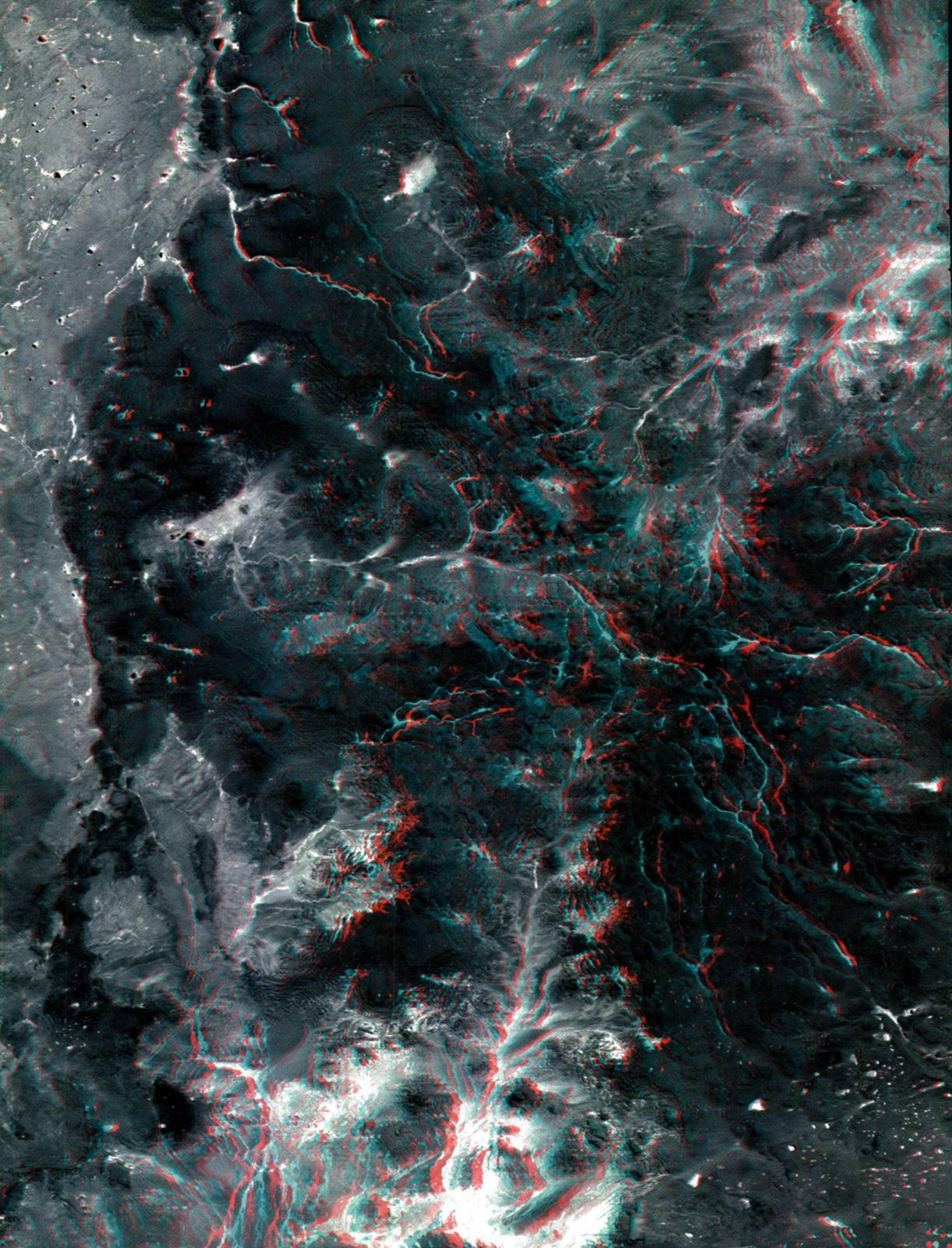
Upper right: Andromeda Galaxy
The best known galaxy other than the Milky Way is M31, the Andromeda Galaxy. At 2.3 million light-years away, it is large enough to be seen with the naked eye from a dark location. Two small companion galaxies, M32 and NGC 205, flank either end.

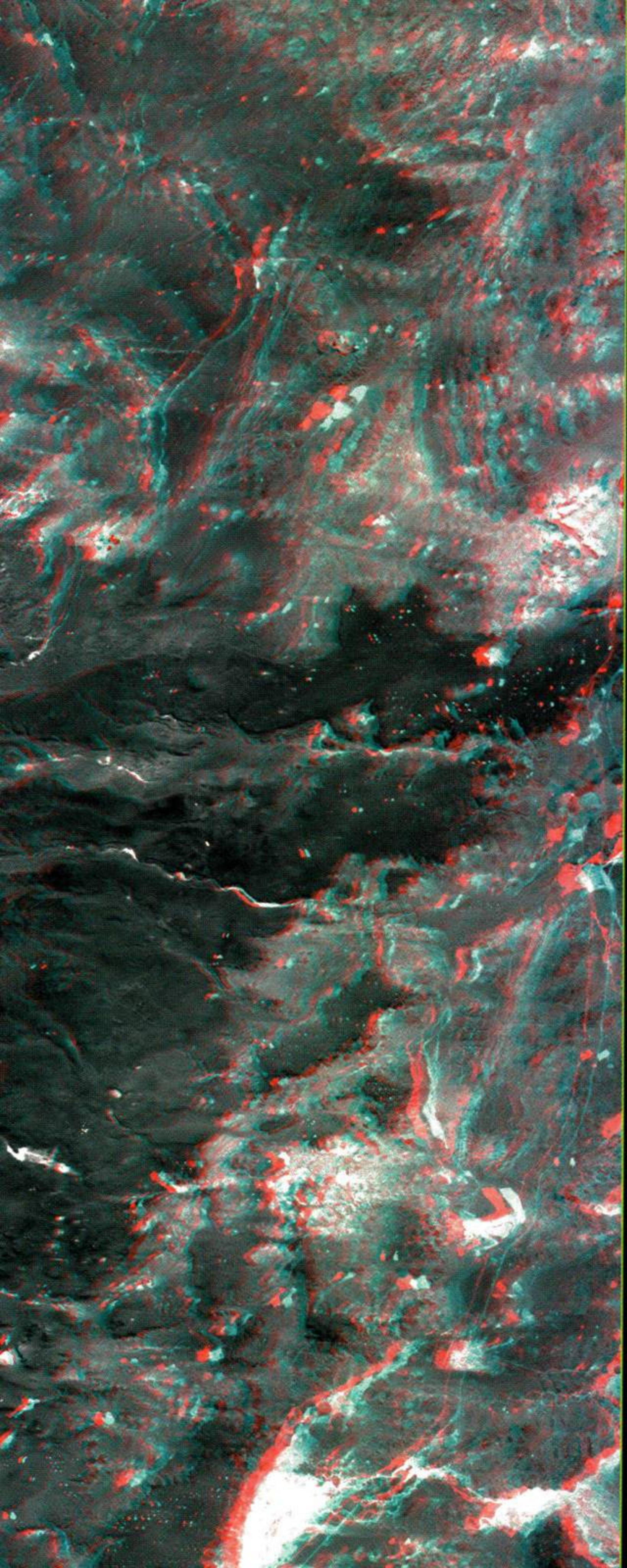
Lower right: Rosette Nebula
The Rosette Nebula (NGC 2237–9) and its associated star cluster (NGC 2244) lie 5,500 light-years away in Monoceros. The radiation pressure from the central stars carved out the donut shape of the nebula. About 40,000 stars populate this image.









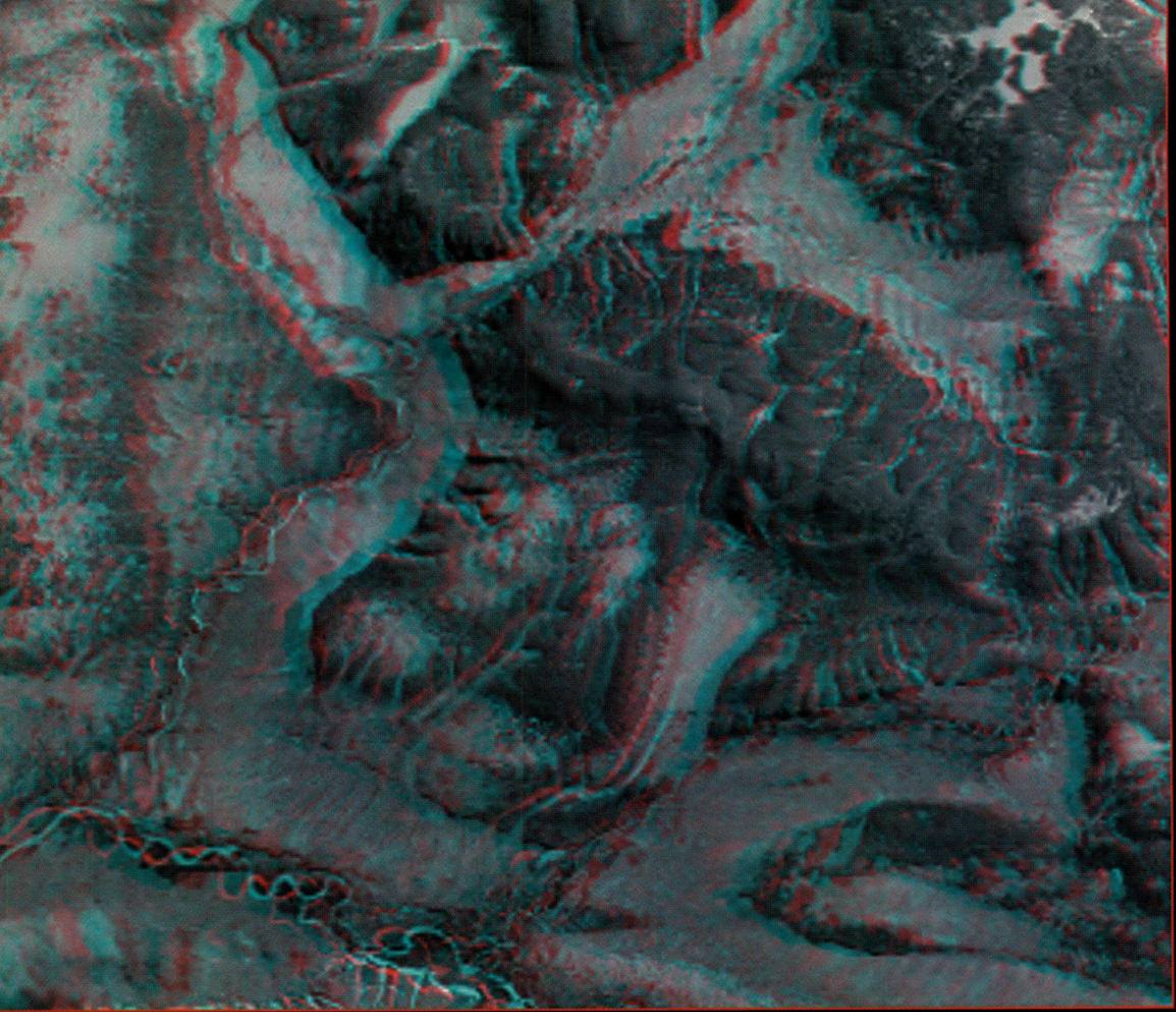


3-D EXTRAVAGANZA

Earth is a Planet, too

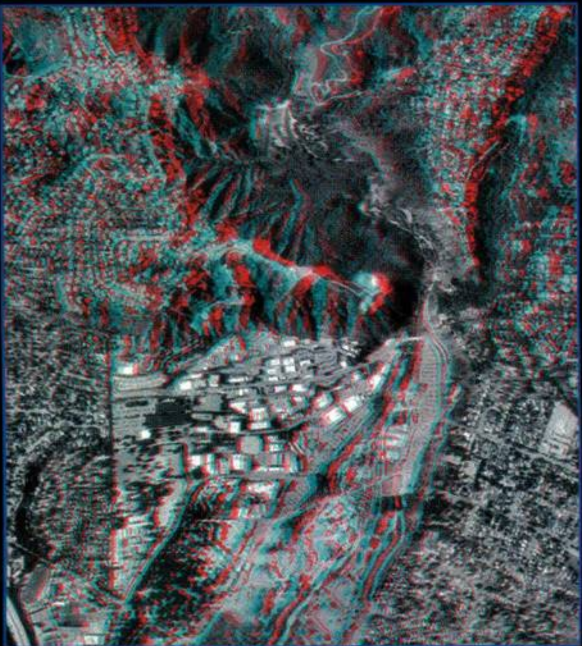
For those of us who treasure seeing the universe in all three dimensions, NASA's Shuttle Radar Topography Mission (SRTM) was a godsend. On February 11, 2000, SRTM set about its 11-day mission to map Earth in three dimensions using radar. The resulting data, still being processed and released, will produce a topographic treasure covering 80 percent of the planet's landmass. The $133-million mission unfurled the largest rigid structure yet flown in space, a 200-foot interferometric synthetic aperture radar mast, which produced more data than all that is held by the Library of Congress. What we present over the following pages is a mere sampling from the finest archive of topographic Earth imagery ever produced, and one that will benefit not only scientists, but pilots, the military, commercial users, and even those who simply enjoy the outdoors. A — Dave Eicher

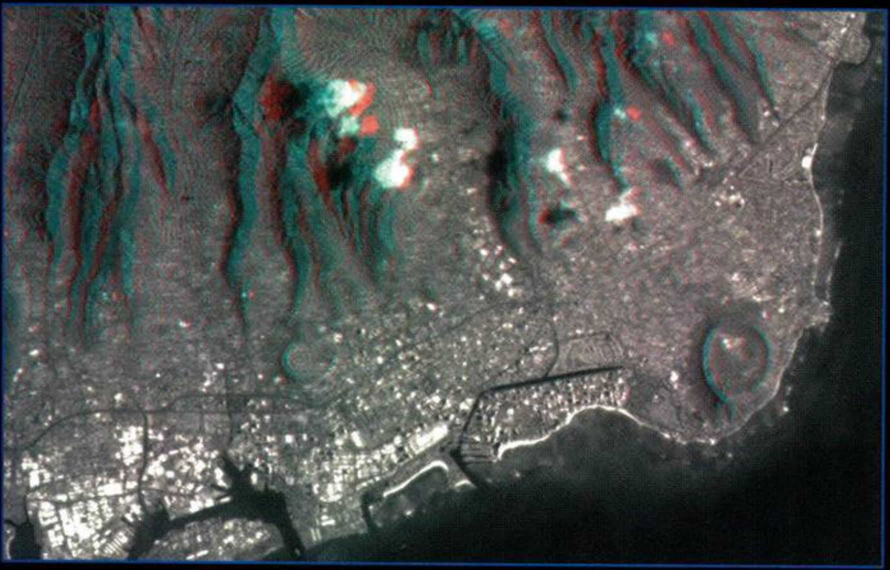
Patagonia, Argentina
Northern Patagonia at Los Menucos, Argentina, reveals a region scarred by the remnants of young volcanoes peppering an eroded rock plain. The volcanoes show holes that indicate they may have collapsed soon after forming.



The Kamchatka Peninsula, Russia
The meandering channel of the Tigil River winds its way below steep cliffs in this volcanically active region. The terrace at left center was cut by the force of the river.

Pasadena, California
The Jet Propulsion Laboratory stands below center in this mountainous image. The canyon cutting through the image is the Arroyo Seco, which drains water from the mountains. Residential portions of La Canada and Flintridge (left) and Altadena and Pasadena (right) also appear.



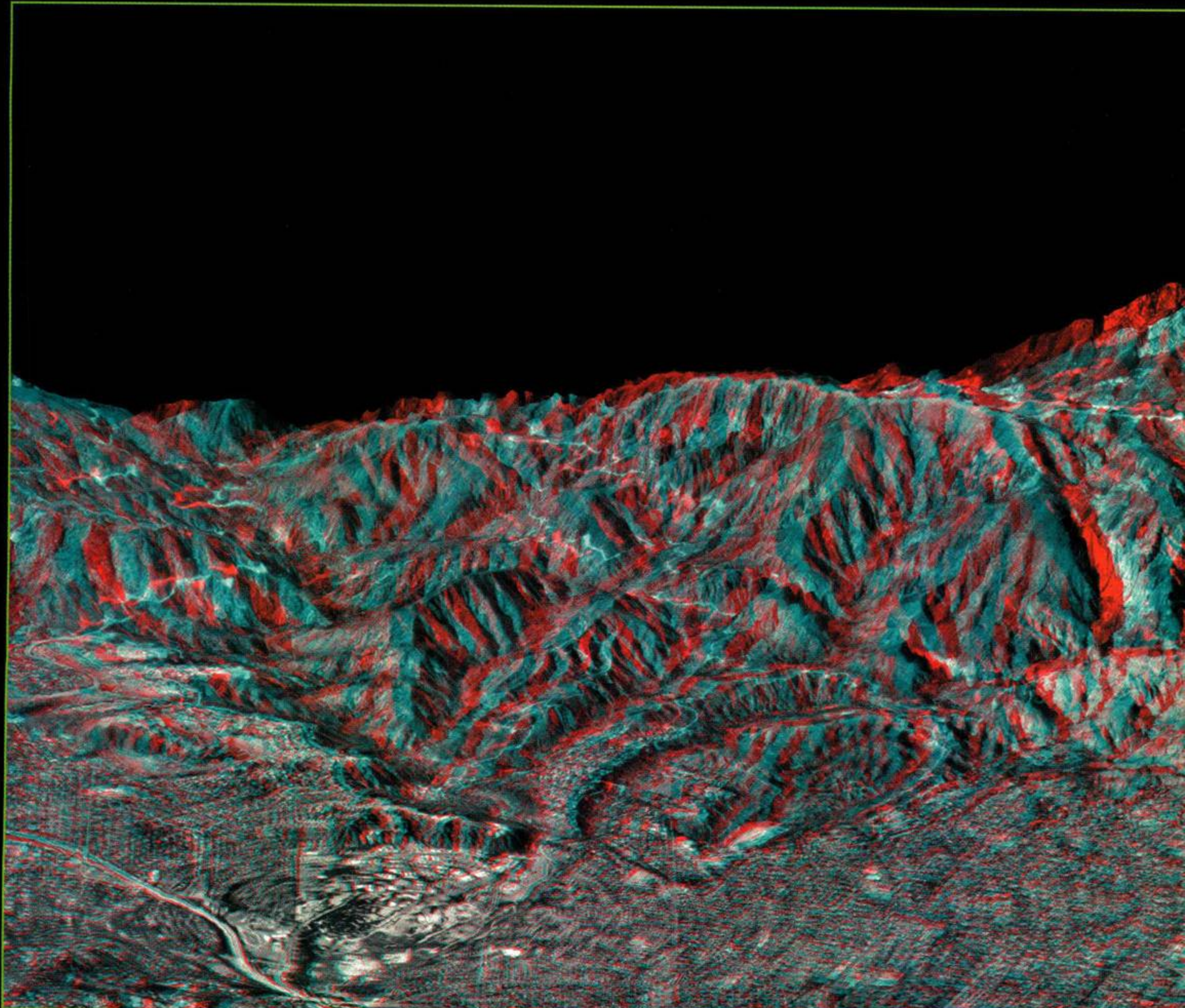


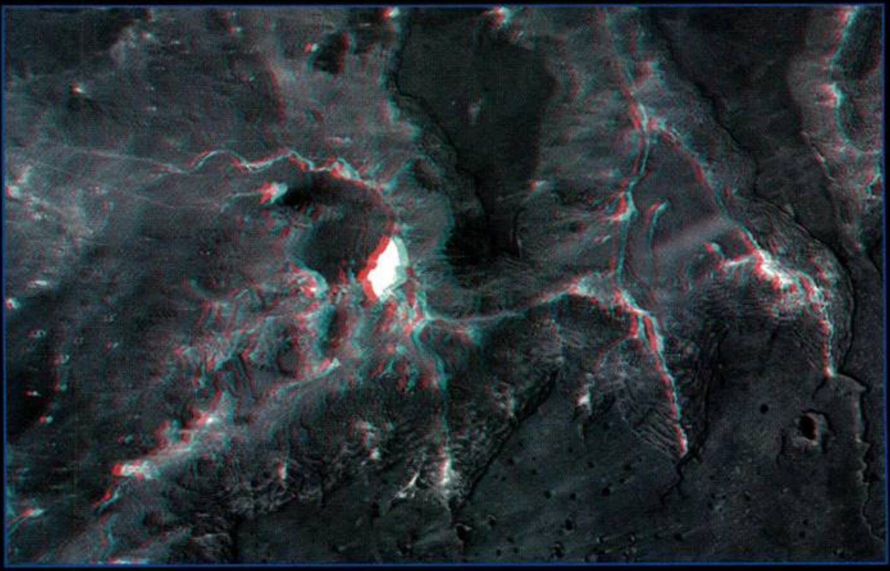
Honolulu, Hawaii

The extinct volcano Diamond Head (right) dominates this view that also includes Waikiki Beach (left of Diamond Head) and the Punchbowl National Cemetery (left of center). Downtown Honolulu and the surrounding harbor appear at bottom left.

The San Gabriel Mountains at Pasadena

A northward perspective view toward the San Gabriels encompasses the cities of Pasadena, Altadena, Flintridge, and La Canada. JPL shows up left of center in this view.



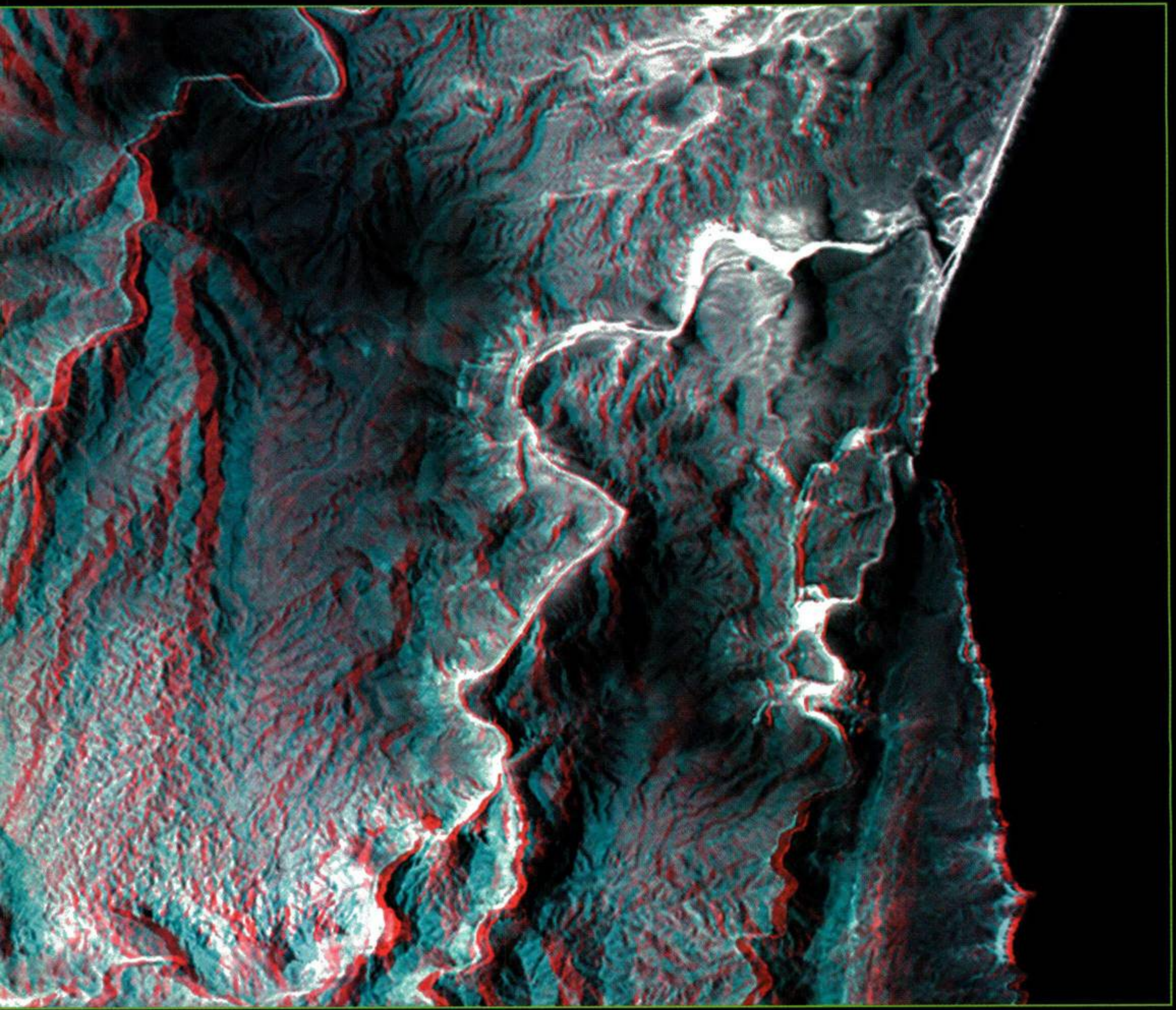


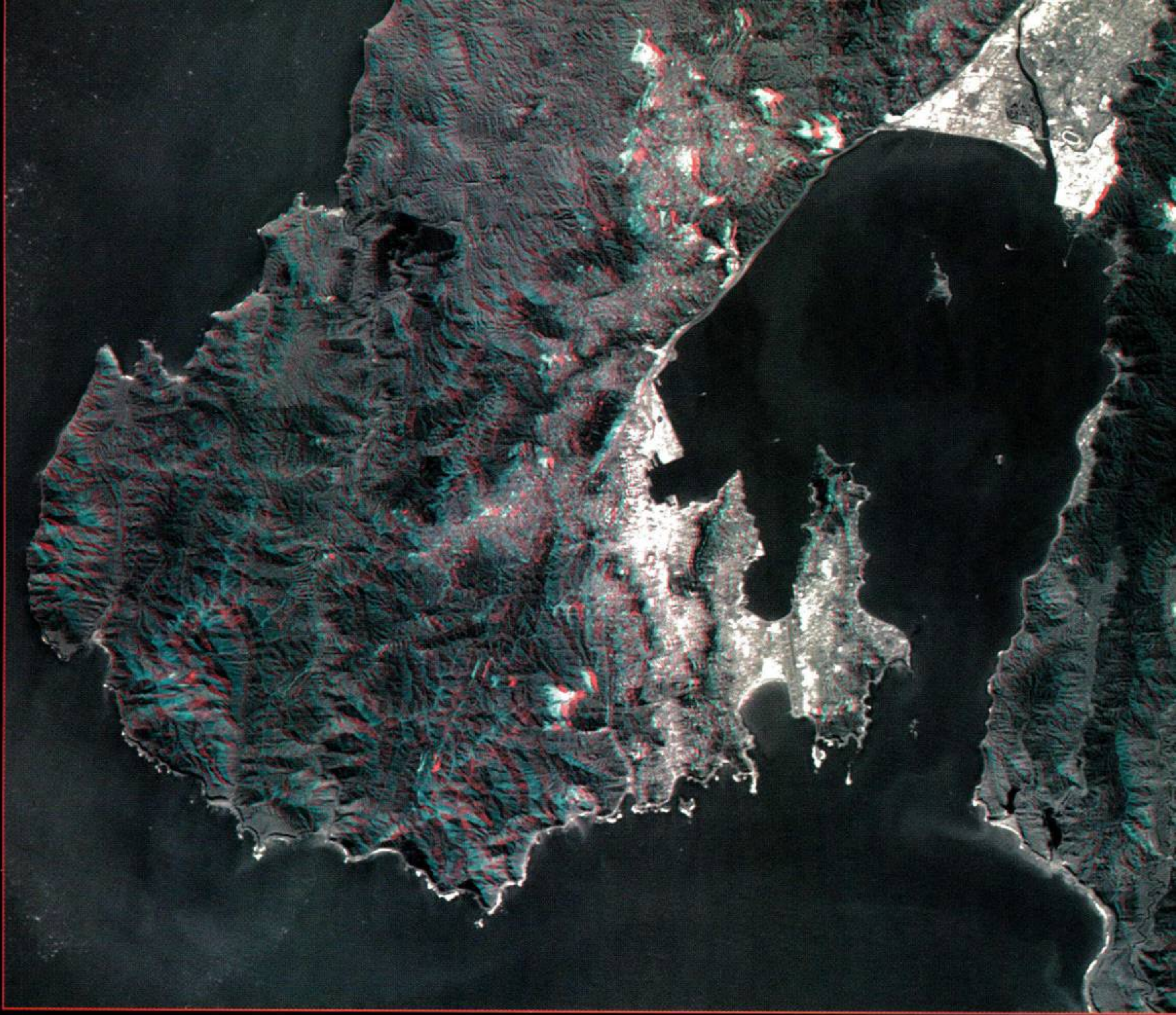
Meseta de Somuncura near Sierra Colorada, Argentina

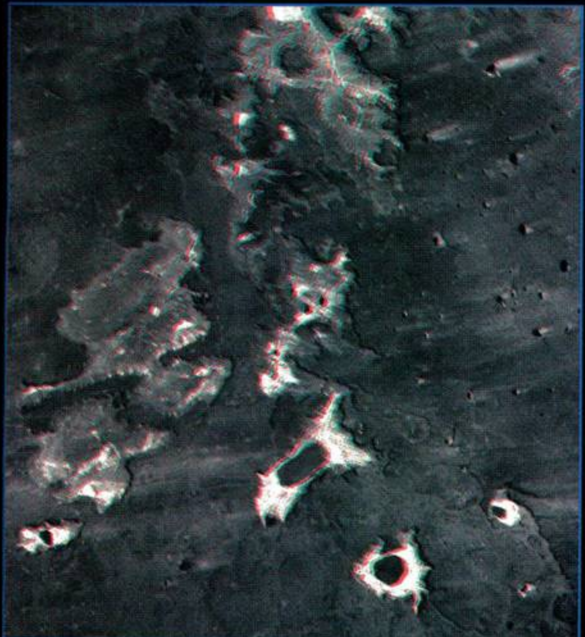
Weird patterns of erosion are visible, with many cliffs appearing to be rock staircases marked by the same color as the plateau's basalt. They may be slivers of rock breaking away from the caprock and sliding downslope.

Coastal Oman

Canyons dart across the coastline adjacent to the Arabian Sea in this image that depicts sculpting processes. The coast in the upper portion of the image seems to blend into the canyon below it; both were produced by a single fault in the underlying limestone bedrock.







Wellington, New Zealand
New Zealand's capital lies on the shores of Port Nicholson, a natural harbor on the island. Rugged hills tower some 1,000 feet above the city and prevent its further growth; seismic faults dictate the pattern of canyons and hills.

Meseta de Somuncura, Argentina
The northwestern part of the plateau shows many depressions where the high-altitude basaltic rock has collapsed. This occurred due to voids in the underlying rock, caused by lava tubes or limestone dissolved by water erosion.

Space Junk

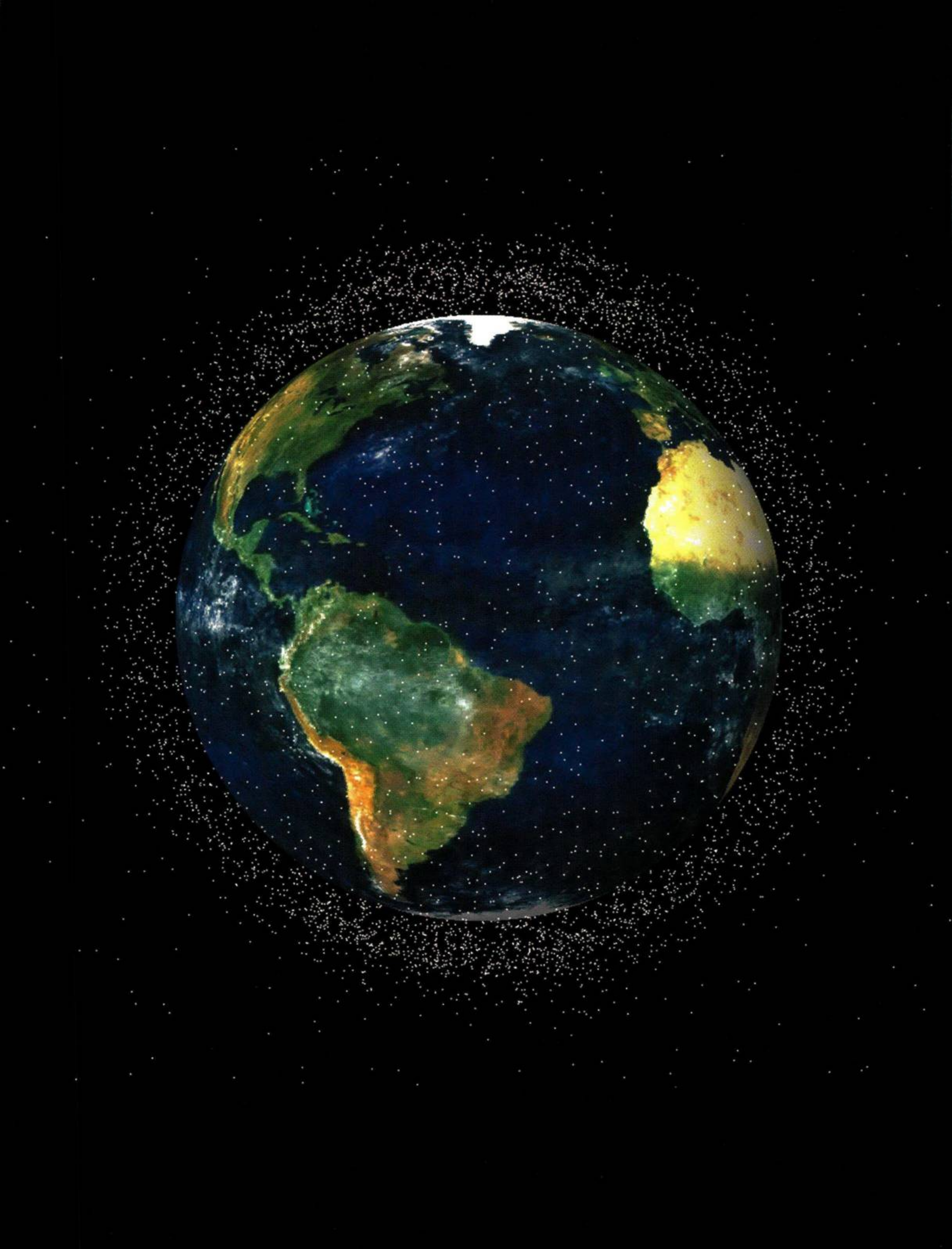
Countless pieces of old spaceships and spent rockets zip around the globe at 16,500 miles per hour. Fortunately, nothing catastrophic has happened … yet.

by Robert Coontz Jr.

The STEP II satellite flew smoothly into orbit in 1994. Unfortunately, so did the upper stage of the rocket that carried the U.S. Defense Department research mission aloft. The useless oil-drum-sized rocket body with leftover hydrazine fuel and a high-pressure tank of helium was orbiting at an altitude of 390 miles on June 3, 1996, when it exploded without warning. On Earth, radar operators noted the blossoming of 700 fresh pieces of metallic confetti. NASA was rightfully alarmed: the pieces that scattered hundreds of miles upward would pose dangers for centuries, and the chunks that veered downward could hit the Hubble Space Telescope or a space shuttle.

The shards of STEP II are part of a quietly growing threat to near-Earth space. The plunge four years later of the Compton Gamma-Ray

This computer-generated image reveals our orbiting junkyard. This image and all photographs: NASA, LBJ Space Center



An unidentified woman inspects a battered, 500-pound, stainless steel propellant tank from a Delta second-stage launch vehicle. It landed near Georgetown, Texas, in January 1997, and a nearly identical tank landed in South Africa in April 2000.

Observatory into the Pacific Ocean was widely reported, but the real troublemakers are the derelicts remaining in orbit. NASA replaces one space-shuttle window after each flight because of damage caused by orbital debris and meteoroid impacts. The offending particles often are dust-sized (0.01–0.06 mm). They are dangerous because they orbit Earth at such high speeds.

Huge Kinetic Wallop

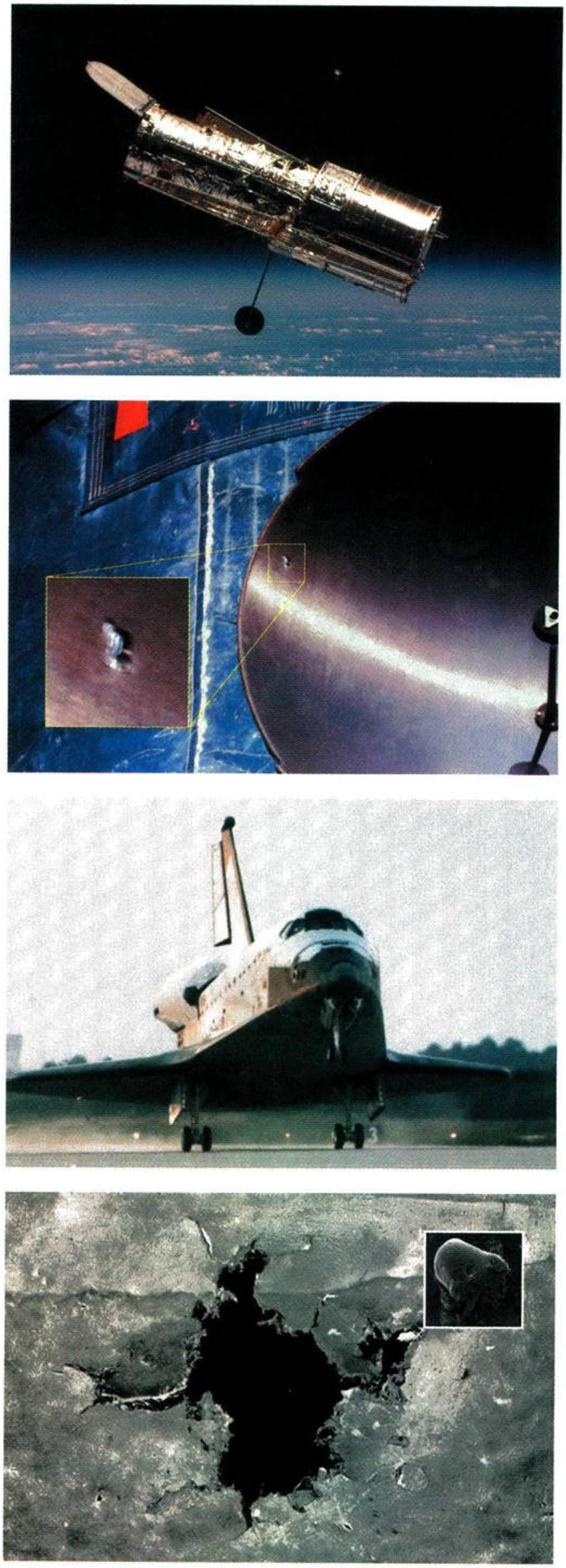
In low-Earth orbit, the vicinity where the space shuttle operates, objects whiz almost randomly at 16,500 miles per hour. In the most likely collision, a shard of metal would sideswipe a satellite in a slightly different orbit at a typical combined relative speed of about 22,000 mph — 40 times faster than a bullet fired from a .38 Special. At that speed, any object packs a kinetic wallop equivalent to more than 20 times its mass in TNT. A slug of aluminum the size of a billiard ball could smash a one-ton satellite into shrapnel. One the size of a grape could pierce the hull of a satellite, melting as it enters and scrambling the innards with a spray of hot shrapnel. Even a BB could puncture one of the shuttle's radiator pipes — prompting an instant return to Earth because of the danger of overheating. Larger pieces of old satellite hulls or rocket bodies could scuttle a shuttle or punch gaping holes in a space station.

"Right now we have about 5,510 tons of man-made objects in Earth orbit, and that's growing at a very steady rate," says Nicholas Johnson, chief scientist and program manager of NASA's orbital debris program at the Lyndon B. Johnson Space Center in Houston. "The more things you put up there, obviously the greater is the probability that they're going to start running into each other." As high-altitude junk accumulates, it may even reach a "critical density" beyond which collisions split off new chunks of debris faster than the fragments can drop out of orbit. That worst-case scenario may already be playing itself out in parts of near-Earth space. With such threats in mind, NASA and the Department of Defense are keeping a watchful eye on orbital debris and are urging governments, businesses, and international organizations to cooperate to halt the continued buildup of the flying waste.

A Wake-Up Call

Scientists were worrying about cosmic collisions when spaceflight was still science fiction. However, in the early days of the space age they focused mainly on the threat posed by meteoroids. The wake-up call from man-made debris came on June 29, 1961.

Two hours after the Transit 4-A satellite reached orbit, the rocket body that put it there exploded into 300 trackable pieces, instantly tripling the total number in orbit. The litter has accumulated with the launch of more payloads. It includes derelict satellites, upper stages of the rockets that had carried them into orbit, specks and beads of aluminum-oxide slag from rocket exhausts, metal bolts, and even garbage dumped by Earth-orbiting missions and space stations. Some of the debris came from satellite explosions — a third of which were detonated to test space weapons or keep



Top to bottom: A space shuttle crew repaired the Hubble Space Telescope, in 1993; during their visit, astronauts noted a ¾-inch impact dent in the telescope's high-gain antenna; space shuttle Columbia lands smoothly in 1995 after a mission; NASA technicians later found a particle of lead-tin solder (inset), only about 1 mm in diameter that had torn a 7mm by 12mm hole in the cargo-bay door insulation.

old spy satellites from falling into unfriendly hands. About 200 tons of rockets and their cargo reach orbit every year. Much of it falls quickly to Earth, but some of it hangs around like useless antiques in the attic, remaining a danger to space navigation for hundreds or even millions of years.

Debris the size of sand grains routinely hits shuttles and satellites, but fortunately nothing catastrophic has happened . . . yet. "You don't have satellites getting knocked out every day by debris," says Colonel T. S. Kelso, a satellite-tracking expert at Wright-Patterson Air Force Base in Dayton, Ohio. The reason is that space, even near-Earth space, is big and debris is still relatively sparse. Even in the most junk-ridden orbits, NASA calculates that a typical satellite with a cross section of the front of a train engine will strike an object bigger than a baseball only once every 10,000 years.

The only confirmed smashup involving space debris took place late in July 1996, when a French military satellite called CERISE, orbiting 421 miles above the surface of Earth, collided with a fragment of a French Ariane rocket that had exploded in space 10 years earlier. The impact sheared a stabilizing boom off CERISE and sent it spinning. (Controllers managed to maneuver it into a controlled tumble, which enabled it to complete part of its mission.)

Shuttle Strikes

At orbital speeds, even an object the size of an ant's head can be dangerous, and small particles are much more common than large ones. With some sizes of debris, whenever you divide the diameter of a particle by 10, you multiply the number of particles by 1,000 — 1,000 marbles, 1 million BBs, and so on. During a decade in orbit, a satellite has better than even odds of striking something 0.04 to 0.4 inch (1 mm to 1 cm) across.

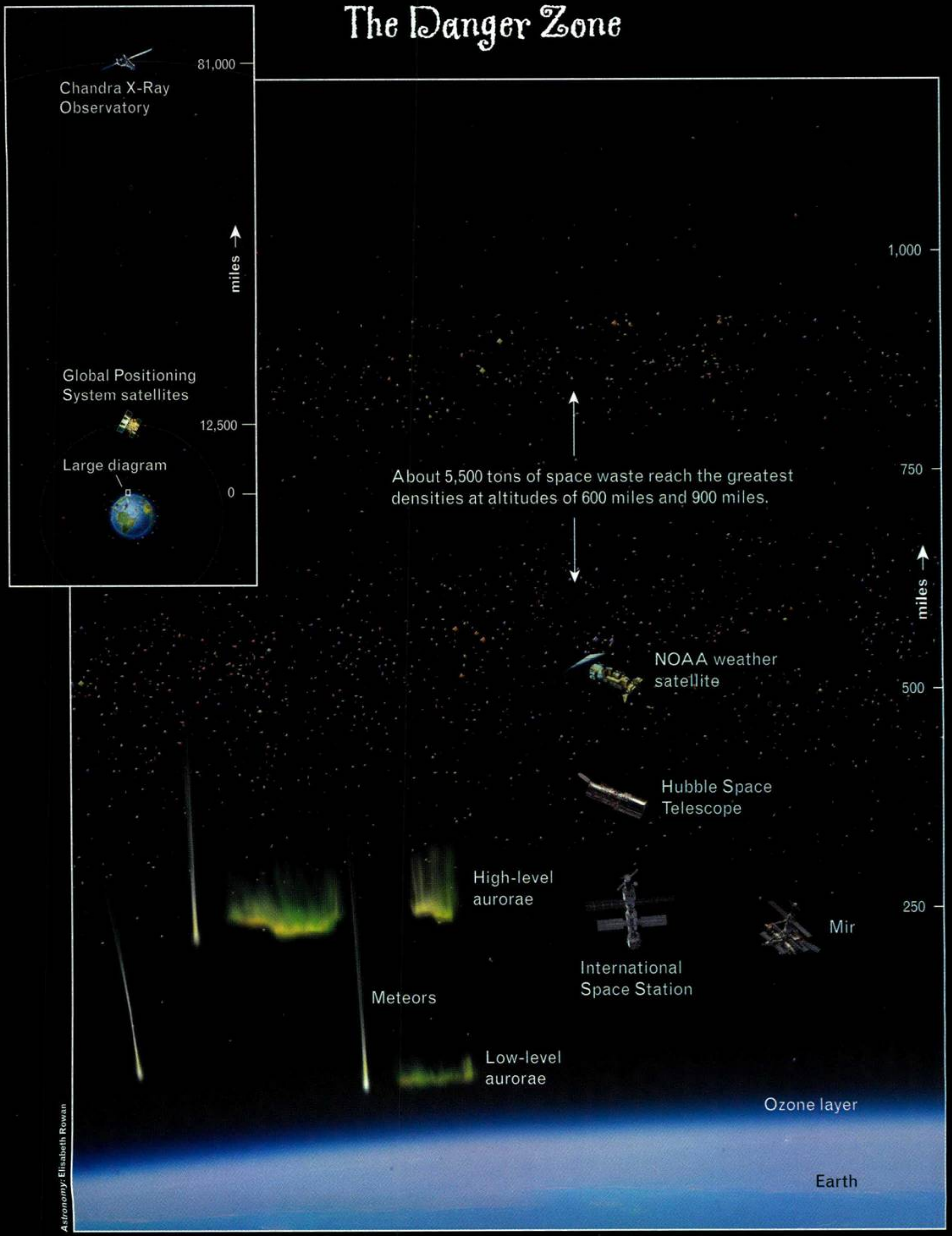
"We've been hit on the shuttle routinely with millimeter-size fragments," says Joseph P. Loftus, Jr., assistant director for engineering, space, and life sciences at Johnson Space Center. In November 1995, a millimeter-wide chunk of circuit-board solder hit space shuttle Columbia, leaving an impact crater the size of a dime. Even the smallest particles pose a threat, as orbital no-see-ums erode satellites with a slow sandblasting that clouds lenses and wears away insulating surfaces.

The risk to spacewalking astronauts is low, says NASA, because they are relatively small targets and they spend only brief periods floating around outside the protection of the shuttle. Even so, every shuttle crew receives training in trauma care and carries medical supplies in case one of them gets winged. Of course, any kind of a hole or tear in a spacewalking astronaut's airtight spacesuit could lead rapidly to fatal decompression.

But debris doesn't just pose a danger to astronauts and their spacecraft; it also hits other debris. When that happens, big particles may split into small ones, just as earthly boulders gradually break down into sand.

Experts fear that debris might take on a life of its own, breakups causing breakups in a chain reaction that produces

The Danger Zone



About 5,500 tons of space waste reach the greatest densities at altitudes of 600 miles and 900 miles.

Chandra X-Ray Observatory
81,000
miles
Global Positioning System satellites
12,500
Large diagram
0
1,000
750
miles
NOAA weather satellite
500
Hubble Space Telescope
High-level aurorae
250
International Space Station
Mir
Meteors
Low-level aurorae
Ozone layer
Earth

Astronomy: Elisabeth Rowan

The Long Duration Exposure Facility (LDEF), launched in 1984 and recovered in 1990, sustained more than 20,000 debris and meteoroid impacts while in orbit.

small particles faster than they can fall out of orbit. For every size and orbit, scientists can estimate the critical density above which the number of particles would keep growing even if rocket launches were to stop today.

Critical Density

Whatever the danger, in space, as on Earth, some neighborhoods are much riskier than others. About 80 percent of active satellites and the debris that could damage them are found in near-Earth orbits below 1,200 miles. "If you animate that, it looks like bees around a beehive," Johnson says. "It's not absolutely random, but it's darned close."

The shuttle usually operates 200 to 250 miles up, a relatively safe, self-cleansing region. At this altitude, the fringe of Earth's atmosphere acts like a brake to slow space litter so that it falls to Earth in weeks or months. That time period is too brief for it to "reproduce." And because it is dropping out of orbit so quickly, a chunk of scrap that hurtles past the space shuttle and its crew on one orbit will probably pass well out of sight on the next.

Greater problems begin around 350 miles, the realm of the Hubble Space Telescope. Above that altitude the atmosphere is so thin that satellites, rockets, and their exploded remains can orbit for tens, hundreds, or thousands of years. As a result, these objects have many opportunities to smash one another to smithereens. Debris concentrations are greatest at 600 miles and 900 miles. At 600 miles the high-speed rubbish heap is 50 times more dense than it is at 200 miles. Some experts think those two orbital regions may already have reached the critical density, though others say the threshold is still decades away.

Above 1,200 miles, things calm down. Meteoroids take over as the main hazard. There are small swarms of debris around 12,000 miles, the realm of the semisynchronous (twice-daily) orbits of Global Positioning System satellites and the Russian counterpart, Glomass.

The last big orbital junkyard appears 22,400 miles out, where satellites in geostationary Earth orbit (GEO) hover over Earth's equator. Traffic there is well behaved; satellites mosey along at a mere 6,700 miles per hour and almost all travel in the same direction, eastward with the rotation of Earth. The main risk of collision comes from overcrowding. GEO is possible only in a small area, a hoop around Earth's equator known as the "stationary arc." More than 700 active and defunct satellites reside there, and companies and governments are always eager to squeeze a few more into this orbital sweet spot. Such satellite tailgating leaves little room for error; any satellite that accidentally drifts off course can imperil its neighbors.

Tracking the Trash

With so much at stake, spacefaring nations keep a careful eye on the flying garbage. The world's premier junk watcher, the U.S. Space Command, runs the Space Surveillance Network (SSN), a system of military radar and telescopes at two dozen sites around the world. The SSN is designed to pick up "resident space objects" that might pose a threat to the United States. (Russia operates a smaller network called the Space Surveillance System.) At the North American Aerospace Defense Command (NORAD) complex inside Cheyenne Mountain, Colorado, the Space Command keeps tabs on about 9,500 orbiting objects. The uniformed observers at the monitors are always at work, deleting the dropouts and logging the new births — launches, explosions, garbage dumps. Each object is numbered in sequence starting with the rocket that bore Sputnik-1 into orbit on October 4, 1957; the number hit 26,497 in mid-September with the addition of a SYLDA payload adapter from a European Ariane-5 rocket launched on the 14th.

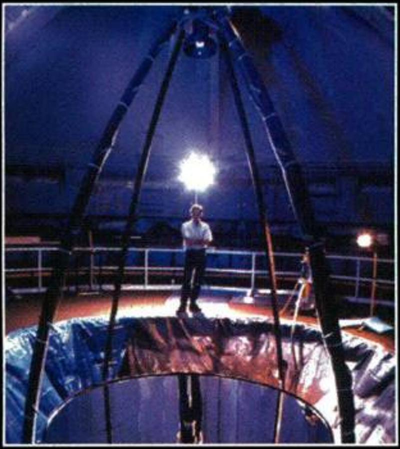
Trackers log about six explosions a year, adding the pieces to a roster. The rocket that launched STEP II amazed the Cheyenne Mountain observers by bursting into 10 times the usual number of trackable pieces. Scientists concluded that fragments of graphite-coated aluminum foil from the fuel tank had turned into dipole antennae, making them unusually bright and easy to track with radar.

Hide-and-Seek Scrap

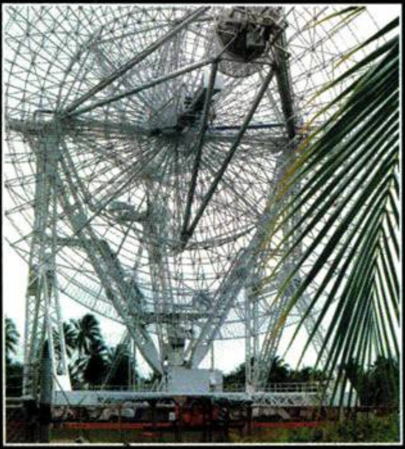
Trackers look at each piece of junk at least once a day. Between sightings, they extrapolate positions. Fortunately, the critical 350- to 1,200-mile-high region is well covered. In GEO, satellites are too far away to be easily tracked; in low-Earth orbit small variations in the thickness of the atmosphere can alter the speed of debris, turning tracking into a game of hide-and-seek. Satellite trackers are wary of "crosstagging," or misidentifying, pieces of debris. "Because of some of the other [military] implications, you can't just say, 'Well, I think it's this one. Just forget about it,' " Kelso says. "You have to do a fair amount of analysis on it."

The roster of tracked satellites and debris, minus spy satellites and military, weather, and Global Positioning System satellites, is listed in a catalog called the Satellite Situation Report, which NASA makes available online. Before each shuttle launch, the Space Command gives NASA a 72-hour forecast of objects likely to cause problems. If a satellite explodes during a mission, NASA analysts examine radar and optical telescope data and quickly predict in which directions the scrap will fly and how dangerous it is.

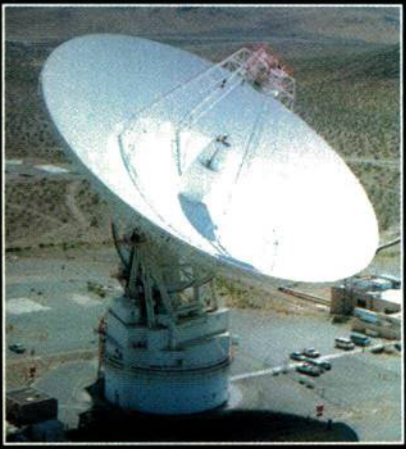
Detecting Debris



NASA uses dozens of ground-based radar facilities and optical telescopes to detect and track space junk. The 3-meter Liquid Mirror Telescope, near Cloudcroft, New Mexico, detects low-Earth-orbit debris as small as 5 centimeters.



The U.S. Army's 45.7-meter ALTAIR (ARPA Long-Range Tracking and Instrumentation Radar) dish on the Marshall Islands' Kwajalein Atoll is one of many radar facilities used to track debris.



JPL's Deep Space Network 70-meter dish antenna in the Mojave Desert in California is primarily used to provide radio communication for NASA's interplanetary spacecraft, but scientists also use it to detect debris.

NORAD's eye on the sky has some major blind spots. Because it was designed to pick up military threats, it ignores 95 percent of the orbiting particles big enough to cripple a satellite but too small to be a missile. NASA does its own studies. Whenever a space shuttle returns to Earth, engineers conduct a head-to-tail inspection for dents and pits. They determine what hit the shuttle, which directions they came from, and how fast they were moving. They look at astronauts' photographs of Mir and the Hubble Space Telescope. Using the Haystack Orbital Debris Radar, the Goldstone Deepspace Communications Complex, and other radar installations and telescopes, NASA can spot space debris as small as mosquitoes. The data forms a basis for computer models that NASA scientists use to plan missions, design spacecraft, and keep orbital junk under control.

One of the models, ORDEM (for orbital debris engineering model), calculates what is up there and where it is. Another, EVOLVE, uses statistics to forecast how the debris will grow over decades to come, under various assumptions about launch rates and cleanup policies. The third, BUMPER, enables mission planners to fly a virtual spacecraft along any course and predict how many particles will strike it, where they will hit the craft, and how much damage the junk will cause.

Get Out of the Way

NASA's orbital-debris simulations show that the most effective way of coping with the problem is to avoid it. Shuttle astronauts get a warning whenever a piece of debris will come within a 3 by 15.5 by 3-mile "alert box" centered on the craft, and they must dodge anything heading into a 2.5 by 6 by 2.5-mile "maneuver box."

For satellites the rules are less strict. Tracking data and computer models are imprecise and generate false alarms of impending collisions. As a result, satellite owners leave their craft in place and hope for the best. The gamble has paid off — so far. To reduce the danger from uncharted debris, shuttle pilots can simply point the most vulnerable parts of the craft away from the directions most debris comes from, above and ahead of the orbital path. The BUMPER model shows that the safest way of flying the shuttle, tail-first and belly up, is only 5 percent as risky as the most dangerous, back forward and nose pointed toward space.

The International Space Station will be risky for astronauts, so NASA is reinforcing its most vulnerable parts.

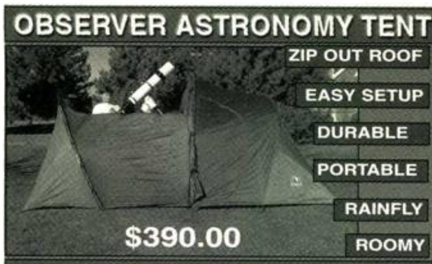
Clean Up Your Act

NASA makes rocket bodies and satellites nonexplosive by running down their batteries and venting any pressurized fluids and leftover fuel. Mission controllers can even use the extra fuel to swing a rocket into a fast-decaying orbit. There is no need to shoot it straight back to Earth; the EVOLVE model shows that any orbit that lasts less than 25 years will do the job almost as well. Geostationary satellites, which are too far out to return to Earth, can be boosted into "graveyard orbits" hundreds of miles away from the stationary arc. That could also work at lower altitudes, but NASA prefers to avoid cluttering up that potentially valuable real estate.

So far, Johnson says, the news is good: spacefaring nations and companies have met or even exceeded NASA's recommended standards. If they keep it up, and if newcomers follow suit, orbital debris may well remain a nuisance rather than a peril. "It's a classic environmental problem," Johnson says. "If you tackle it early on, it's relatively easy to control. If you wait until you start to see serious consequences, then it may be too late." ■

Robert Coontz Jr. is a deputy news editor for physical sciences at Science *magazine who lives in Alexandria, Virginia.*

OBSERVER ASTRONOMY TENT


ZIP OUT ROOF
EASY SETUP
DURABLE
PORTABLE
RAINFLY
ROOMY

$390.00

SHELTER-DOME TENT

Optional rain fly $95.00

4 ZIP OUT SLOT
LIGHTPROOF
FAST SETUP
PORTABLE
DURABLE
ROOMY

$375.00

OBSERVING CHAIRS

ULTIMATE......$125.00 **ULTIMATE II...$160.00**

Ultimate II has a folding accessory tray for eyepieces filters, charts etc.

Made from Baltic Birch Plywood.

Seat is adjustable from 9" to32"

Buy Direct of from your Favourite Dealer!

KWIK FOCUS

BEFORE
AFTER

ETX	$30.00	AP 155mm	$35.00	10" SCT	$45.00
C5..ETX 125	$30.00	7" Mak	$40.00	11" SCT	$50.00
AP 105mm	$30.00	8" SCT	$40.00	12" SCT	$55.00
AP 130mm	$30.00	9.25" SCT	$45.00	14" SCT	$60.00

LASER COLLIMATORS

Collimators for Schmidt Cassegraines and Newtonians

1.25" $100.00
2" $110.00
SCT.......$160.00
SCT NGF-S.....$175.00
Difractive optic collimator $175.00

SUN FINDER

Fits over your Telrad. Find and center the sun in your eyepiece in seconds!!...................**$30.00**

CORONADO INSTRUMENTS H - ALPHA SOLAR FILTERS AND TELESCOPES-FULL LINE

DEW REMOVER SYSTEM

controller	$70.00	Telrad heater	$23.00
.965"	$33.00	Telescope computer control heater	$35.00
1.25"	$35.00	**Felt lined Flexible Dewcaps**	
2"	$38.00	ETX	$25.00
3"	$40.00	C5 / ETX 125	$32.00
4"	$43.00	6"	$42.00
5"	$45.00	7"/C8"	$50.00
6"	$48.00	C9.25	$55.00
7/8"	$50.00	10"	$60.00
9/10"	$60.00	C11"	$70.00
11"	$65.00	12"	$85.00
12"	$70.00	C14"	$105.00
14/16"	$80.00		

DEWCAPS

Flexible, Felt lined, Durable.
Save up to 85% vs Brand Name.

BATTERIES

12V 17 AMP HOUR

Comes with float charger, carry bag, built in fused cigarette lighter power socket. **$125.00**

33 AMP HOUR BATTERY

4 fused power plugs, LCD for state of charge, 1 amp float charger, carry bag
Comes in two configurations

12 volt......$290.00
18 volt......$390.00

18 volt version is for LX 200 owners.

One plug has a built in inverter for 18 volt output.

We accept all major credit cards

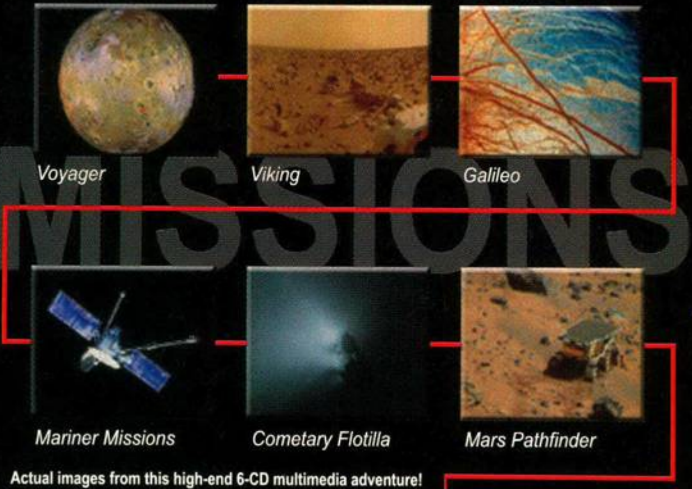
KENDRICK ASTRO INSTRUMENTS

2920 Dundas St. West, Toronto, Ont M6P 1Y8, Canada
Tel 416 762 7946 Fax 416 762 2765
kendrick-ai.com email: kendrick@kendrick-ai.com

Travel to Mars for under $100!

HIGHLIGHTS

- Interactive multimedia space exploration!
- Guide to worlds of our Solar System
- Historic and future planetary missions
- Interesting scientific and engineering data
- Guided tours of planets and major moons
- Unique mission vehicles
- Exclusive video interviews with **Arthur C. Clarke**



Actual images from this high-end 6-CD multimedia adventure!

EXPLORING THE PLANETS

3 easy payments of $33!

CALL NOW TO ORDER
1-800-554-9915
or visit www.cinegram.com

FREE with first 1,000 orders

"Solar System Explorer" CD-ROM	$29.95 retail value
PLUS discount coupons for other great products from Cinegram Media	+ $30.00 retail value

Total Savings: $59.95

Arthur C. Clarke* says:
"With programs such as ***Exploring the Planets***, we can explore space from our own homes."

*Author of *2001: A Space Odyssey*

EXPLORING THE PLANETS

sky Show

december

Celebrate the holidays with a partial solar eclipse.

by Martin Ratcliffe and Alister Ling

▶ Is there a better holiday gift than a telescope? How about a solar eclipse? If clear skies reign on December 25, North American observers will get the gift of the moon passing in front of a portion of the sun. Consult the November issue for many ways to watch this eclipse safely. Free solar viewing glasses will be included in next month's issue (both for subscribers and also on newsstands in early December). If you live in the northwest you can witness a delightful sunrise with a bite taken out of it.

Not only does the partial solar eclipse fall on Christmas, for the United States it is also the final day of Ramadan, the holiest month in Islam. The third major world religion, Judaism, will be in the middle of Hanukkah when the partial solar eclipse occurs.

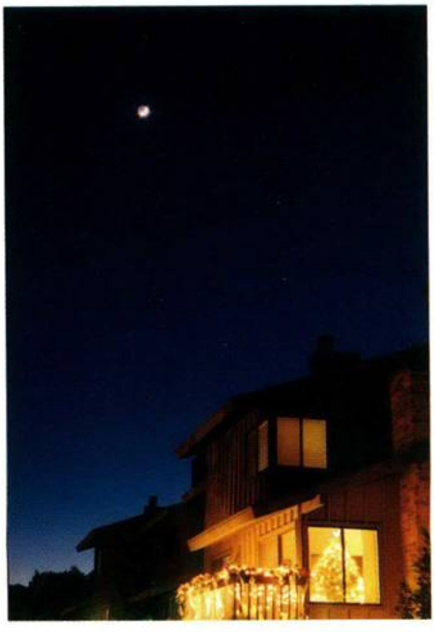
The blazing evening star, Venus, makes a beautiful backdrop for live nativity scenes. Don't miss the monthly opportunity of watching the slender crescent moon adorn Venus's radiance. On November 29, as well as December 29, the striking pair highlights the evening sky.

Not to be outdone by inner solar system grandstanding, the gas giants Jupiter and Saturn take the stage in the eastern sky after evening twilight. As always, there is plenty going on. The rings of Saturn are open wide and together with a thin shadow of the globe on the rings they produce a striking "3-D" experience. Will the Great Red Spot make a comeback this year? See for yourself.

Winter solstice occurs on December 21st at 8:37 A.M. EST. Solstice is significant because the sun appears at its southernmost point in its path around the sky. The days will once again lengthen, but for those of us living in the Snow Belt, it is merely a reminder that winter is just about to set in hard. Just like water placed in a freezer, there's a time lag before the coldest point is reached.

The annual Geminid meteor shower peaks on the night of December 13/14, presenting its maximum to European observers. First the bad news: the almost full moon will wash out the fainter shooting stars. And the good news: Geminids are known to have plenty of bright meteors, including a handful of fireballs, so you can observe from the city without missing a whole lot. Expect 10 to 15 meteors per hour.

A partial solar eclipse for all of North America is the highlight of December. Tony Zonta



This holiday scene includes the moon and the planet Mars. Peter Ward

2000
December

1 The moon passes 2° south of Uranus, 8 P.M. EST

3 First quarter moon is at 10:55 P.M. EST

4 Pluto is in conjunction with the sun, 9 A.M. EST

6 Asteroid Psyche is at opposition, 3 A.M. EST

9 The moon passes 1.8° south of Saturn, noon EST (page 70)

10 The moon passes 3° south of Jupiter, 3 A.M. EST (page 70)
Mars passes 4° north of Spica, 8 P.M. EST

11 Full moon is at 4:03 A.M. EST
Venus passes 3° south of Neptune, 4 P.M. EST

12 The moon is at perigee (224,068 miles from Earth), 5:22 P.M. EST

13 Geminid meteor shower peaks

17 Last quarter moon is at 7:41 P.M. EST

20 The moon passes 4° north of Mars, 2 A.M. EST

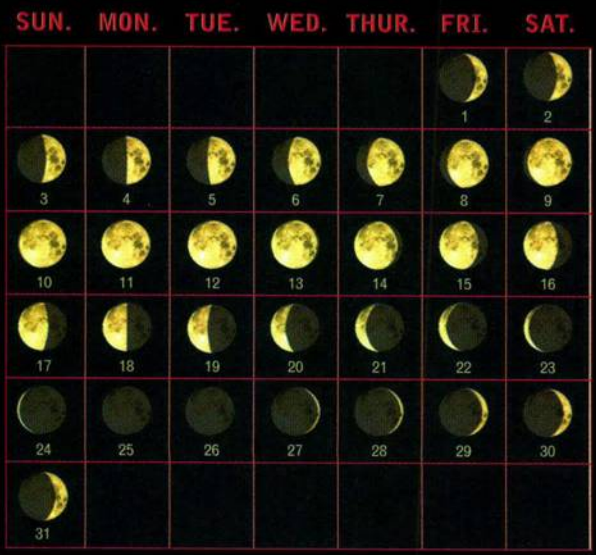
21 Winter solstice is at 8:37 A.M. EST

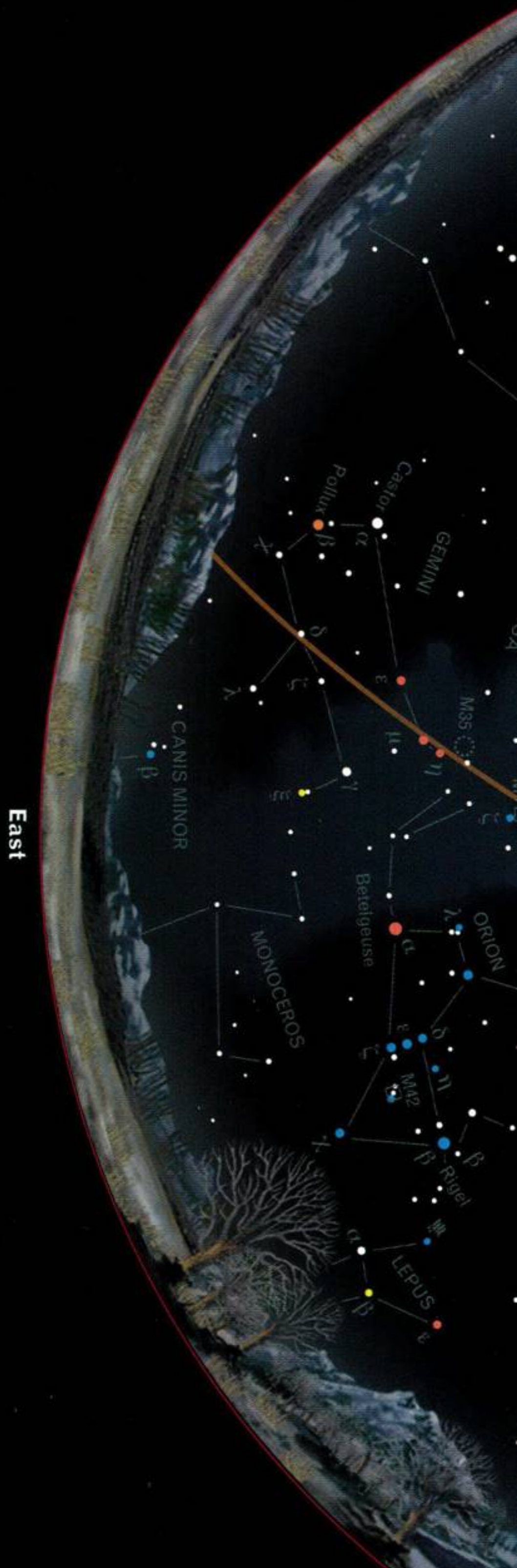
23 Venus passes 1.3° south of Uranus, 4 P.M. EST
The moon passes 0.9° north of Ceres, 6 P.M. EST

25 New moon is at 12:22 P.M. EST; partial solar eclipse (page 72)
Mercury is in superior conjunction, 2 P.M. EST

28 The moon passes 2° south of Neptune, 2 A.M. EST
The moon is at apogee (252,396 miles from Earth), 10:06 A.M. EST

29 The moon passes 2° south of Uranus, 5 A.M. EST
The moon passes 1.8° south of Venus, 5 P.M. EST (page 70)

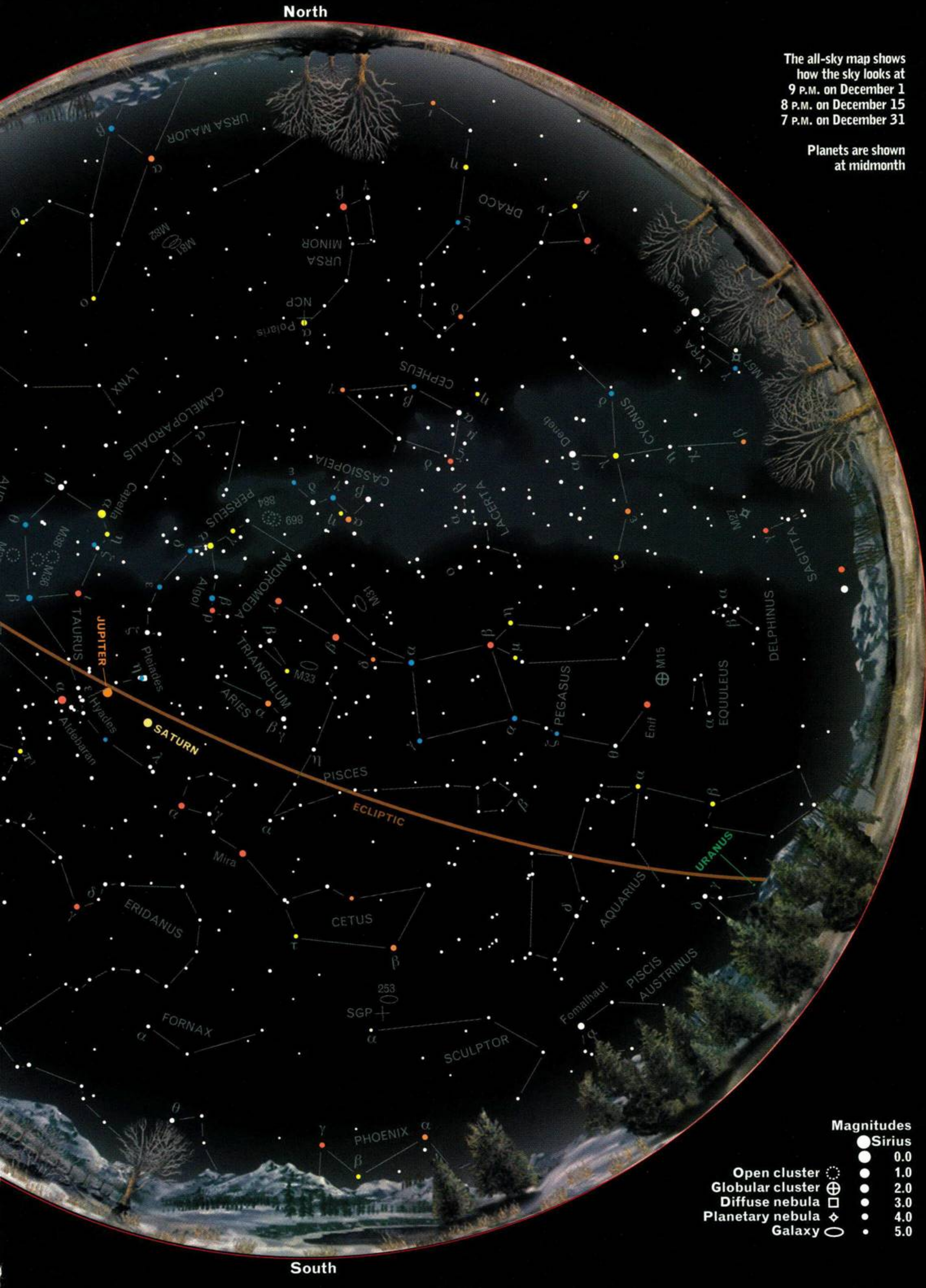

SUN.
MON.
TUE.
WED.
THUR.
FRI.
SAT.
1
2
3
4
5
6
7
8
9
10
11
12
13
14
15
16
17
18
19
20
21
22
23
24
25
26
27
28
29
30
31


East
Pollux
Castor
GEMINI
M35
CANIS MINOR
Betelgeuse
ORION
MONOCEROS
M42
Rigel
LEPUS

This map portrays the sky at times shown in the upper right corner of the page. Located just outside the map are the four directions: north, south, east, and west. To find stars above your horizon, hold the map overhead and orient it so a direction label matches the direction you're facing. The stars above the map's horizon now match what's in the sky.

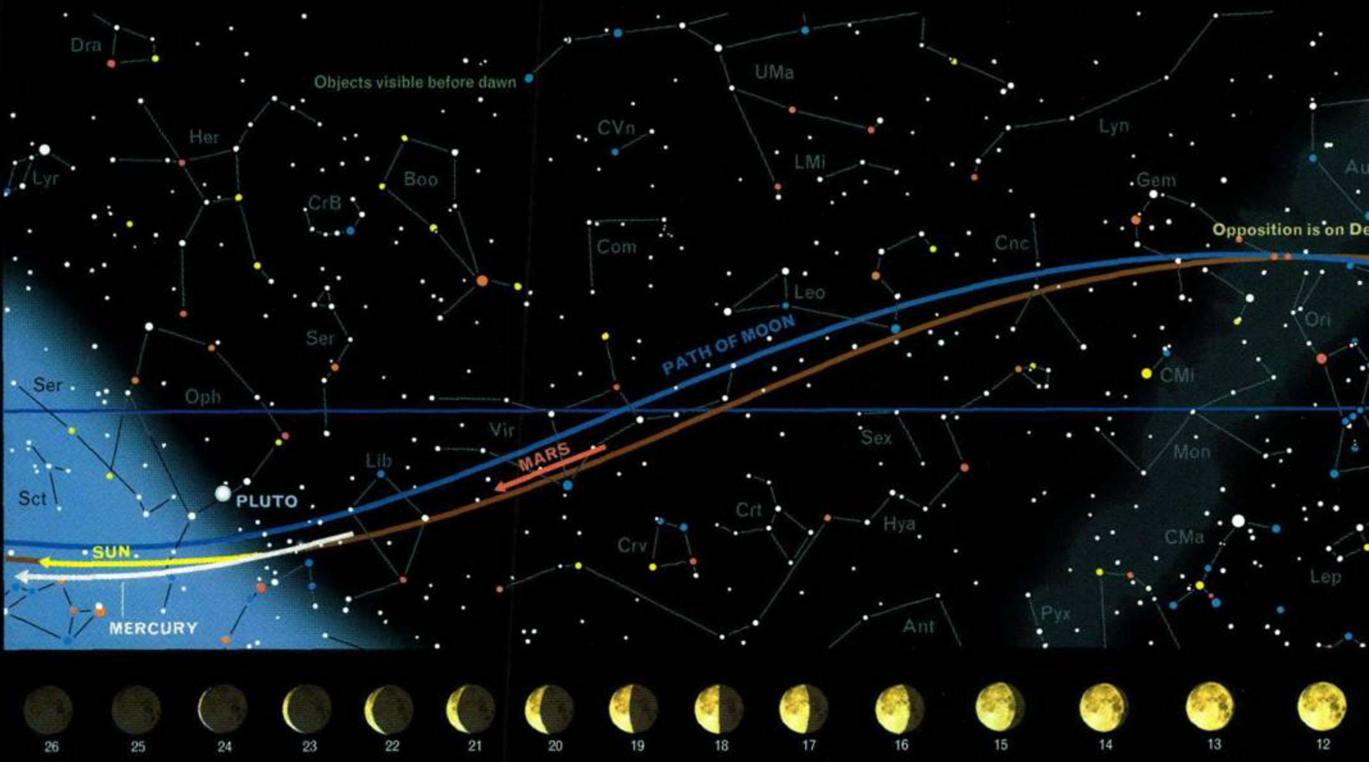
The all-sky map shows
how the sky looks at
9 P.M. on December 1
8 P.M. on December 15
7 P.M. on December 31

Planets are shown
at midmonth

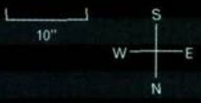

North
URSA MAJOR
M81
M82
DRACO
URSA MINOR
NCP
Polaris
LYNX
CEPHEUS
LYRA
Vega
M57
CAMELOPARDALIS
CYGNUS
Deneb
CASSIOPEIA
Capella
PERSEUS
884
869
M38
M36
M27
SAGITTA
LACERTA
ANDROMEDA
Algol
M31
DELPHINUS
TAURUS
JUPITER
Pleiades
TRIANGULUM
M33
PEGASUS
M15
EQUULEUS
West
Hyades
Aldebaran
ARIES
SATURN
Enif
PISCES
ECLIPTIC
URANUS
Mira
AQUARIUS
ERIDANUS
CETUS
PISCIS AUSTRINUS
253
SGP
FORNAX
Fomalhaut
SCULPTOR
PHOENIX
South
Magnitudes
Sirius
0.0
1.0
2.0
3.0
4.0
5.0
Open cluster
Globular cluster
Diffuse nebula
Planetary nebula
Galaxy

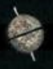
Path of the Planets

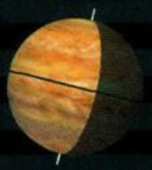
This map unfolds the entire night sky from evening (at right) until sunrise (at left). Arrows and squares show the movements and locations of solar system object

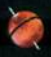

Dra
Objects visible before dawn
UMa
Her
CVn
LMi
Lyn
Lyr
Boo
Gem
Au
CrB
Opposition is on De
Com
Cnc
Leo
Ser
PATH OF MOON
Ori
Ser
Oph
CMi
Vir
Sex
MARS
Lib
Mon
Sct
PLUTO
Crt
Hya
CMa
Crv
SUN
Lep
MERCURY
Ant
Pyx
26
25
24
23
22
21
20
19
18
17
16
15
14
13
12

To locate the moon in the sky, draw a line from the phase





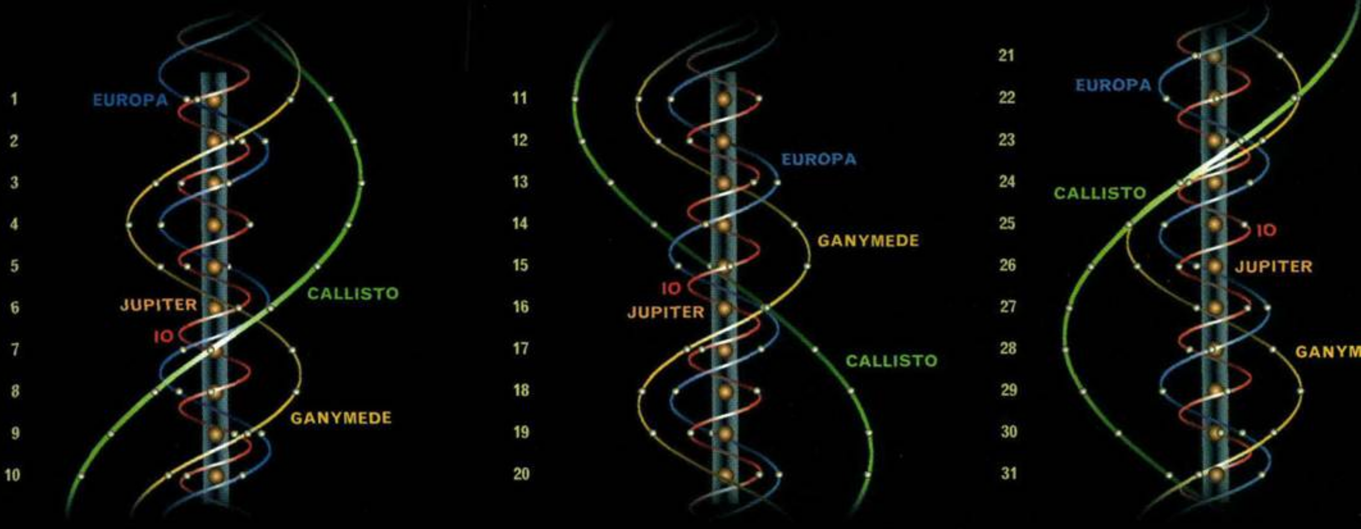




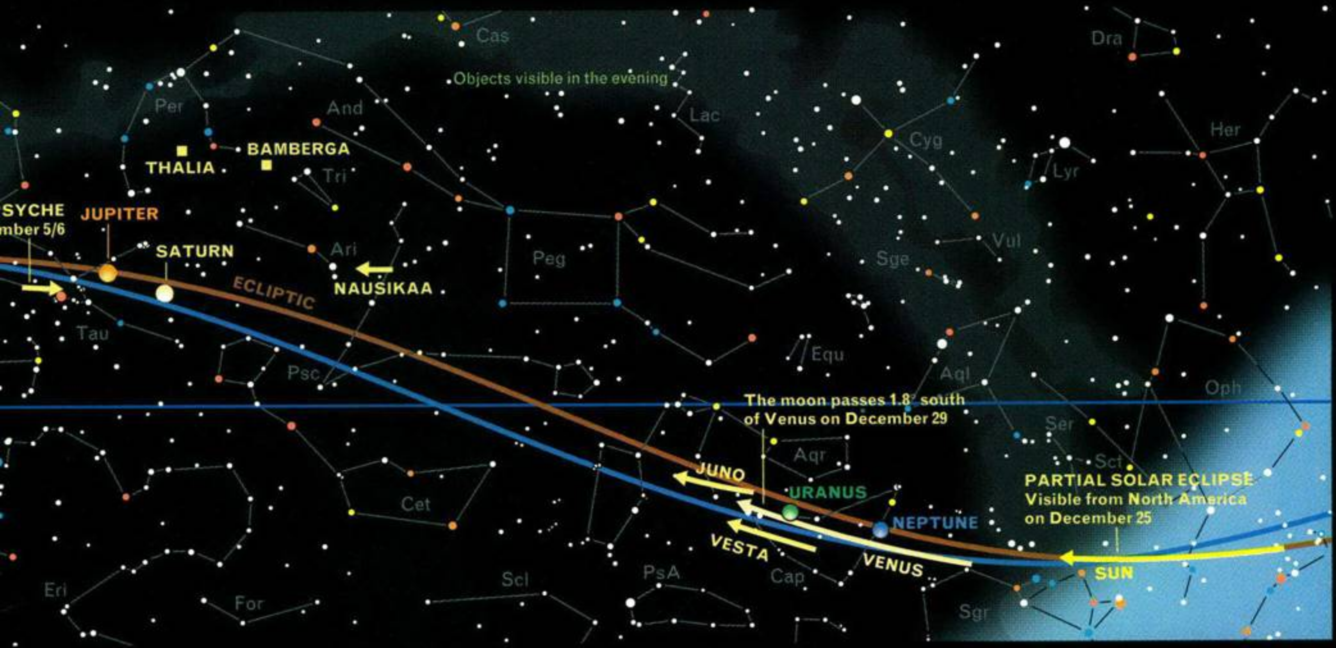
PLANETS	MERCURY	VENUS	MARS	JUPITER
Date	December 1	December 15	December 15	December 15
Magnitude	–0.7	–4.2	1.5	–2.8
Angular Size	5.1"	18.0"	4.8"	48.1"
Illumination	92%	66%	93%	100%
Distance (AU) from Earth	1.310	0.928	1.944	4.102
Distance (AU) from Sun	0.420	0.725	1.657	5.041
Right Ascension (2000.0)	15h34.1m	20h42.9m	13h34.1m	4h08.4m
Declination (2000.0)	–18°12'	–20°30'	–8°26'	20°05'

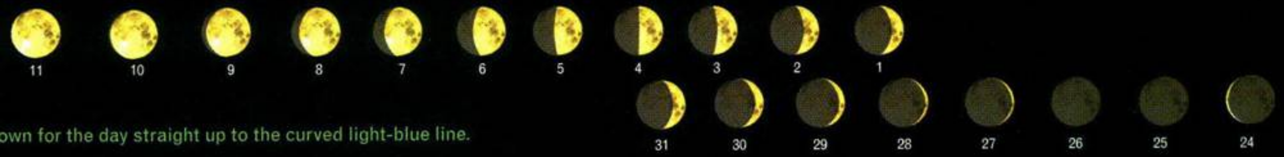
Jupiter's Moons

Dots display positions of Galilean satellites at 10 P.M. EDT on date shown. South is at top to match the view in a telescope.

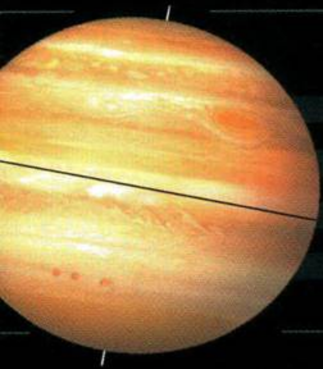


uring the month.


Cas
Objects visible in the evening
Dra
Per
And
Lac
Cyg
Her
BAMBERGA
THALIA
Tri
Lyr
SYCHE
mber 5/6
JUPITER
SATURN
Ari
NAUSIKAA
Peg
Sge
Vul
ECLIPTIC
Tau
Psc
Equ
Aql
Oph
The moon passes 1.8° south of Venus on December 29
Ser
Aqr
JUNO
URANUS
Sct
PARTIAL SOLAR ECLIPSE
Visible from North America on December 25
Cet
NEPTUNE
VESTA
VENUS
Cap
SUN
Eri
For
Scl
PsA
Sgr


11
10
9
8
7
6
5
4
3
2
1
31
30
29
28
27
26
25
24

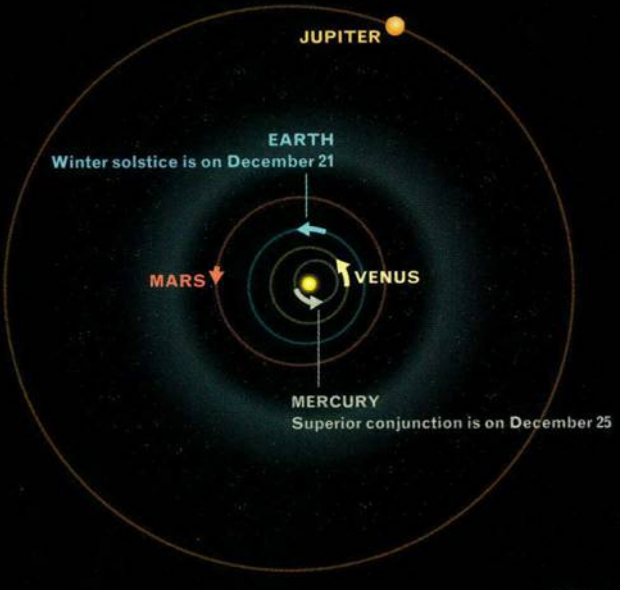
own for the day straight up to the curved light-blue line.



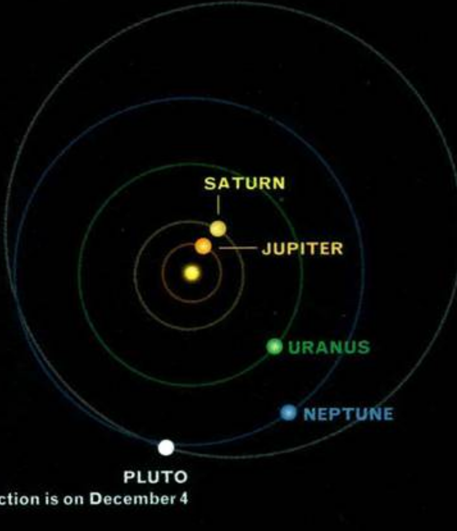
SATURN	URANUS	NEPTUNE	PLUTO
December 15	December 15	December 15	December 15
−0.2	5.9	8.0	13.9
20.2"	3.4"	2.2"	0.1"
100%	100%	100%	100%
8.235	20.511	30.839	31.284
9.116	19.956	30.108	30.332
3h35.0m	21h22.2m	20h28.3m	16h52.1m
16°57'	−16°07'	−18°54'	−12°08'

The Planets in Their Orbits

Arrows and dots show planets' positions during the month.


JUPITER
EARTH
Winter solstice is on December 21
MARS
VENUS
MERCURY
Superior conjunction is on December 25

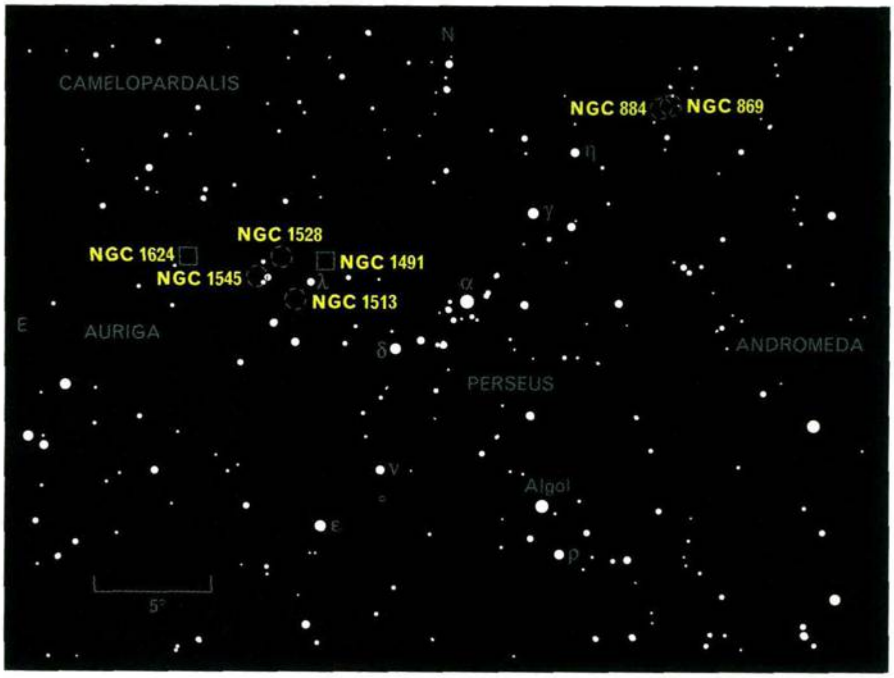
DE


SATURN
JUPITER
URANUS
NEPTUNE
PLUTO
Solar conjunction is on December 4

Curling up with Perseus

Perseus is a great constellation filled with all an observer could ask for, including bright star clusters and variable stars visible from the city, nebulous gas clouds embedded in a spiral arm of the Milky Way, and distant clusters of galaxies.

Millions of years ago in the nearby spiral arm, a cauldron of dust and gas forged the glorious Double Cluster (NGC 869 and 884). The small interstellar clouds developed into single and double stars, while larger dust and gas clouds formed an array of open star clusters. Tucked among the curlicue of naked-eye stars looping in the direction of Capella lie several clusters, some still bathed in the remnants of their prenatal cocoons.



Another beautiful cluster that holds its own against the Double Cluster is NGC 1528. From a large city, this sparkling group readily pierces the urban glow. Because it spans half a moon's diameter, bump up the magnification to 100x or more for increasing contrast against the bright background sky. Inside its triangular outline you might find a circlet or another more imaginative shape. Under darker skies this group really stands out through binoculars or a finderscope.

Also visible from the city is the cluster NGC 1545, sitting right next to the modestly bright star b^1 Persei. Closing in at 100x will reveal a pair of bright yellow primaries with two somewhat fainter ones nearby. More stars radiate outward, forming a shape like a dancing stick man.

In country skies, the background stars of the Milky Way stream through Perseus's environs. Use medium power to search for NGC 1513, a round clump of 20 to 30 stars, half the size of the cluster NGC 1528.

Enshrouded in its cloak of gas, the young NGC 1624 appears as a small nebulous patch in a 4-inch scope. An 8-inch telescope will reveal a number of faint sparkles, but the nebulosity remains ill defined. The radiation pressure from the stars pushes the gas outward, where the remnants will form new stars millions of years from now.

Glowing gas attracted Sir William Herschel's eye on December 28, 1789. The first to log the emission nebula NGC 1491, he described it as "six or seven small stars, with faint nebulosity between them, of considerable extent and of an irregular figure." Photographs display an intriguing cloud with several bright wisps. If you have a nebular filter, especially a high-contrast one, screw it in and duck under a cover or hood around the eyepiece to keep out stray light. These accessories really help to reveal faint swaths in the nebula. Magnifications above 120x help too, making it easier to see finer-scale detail.

Two for the price of one: the famous "Double Cluster" lies in Perseus. John Chumack

The Bright Planets Make a Power Play

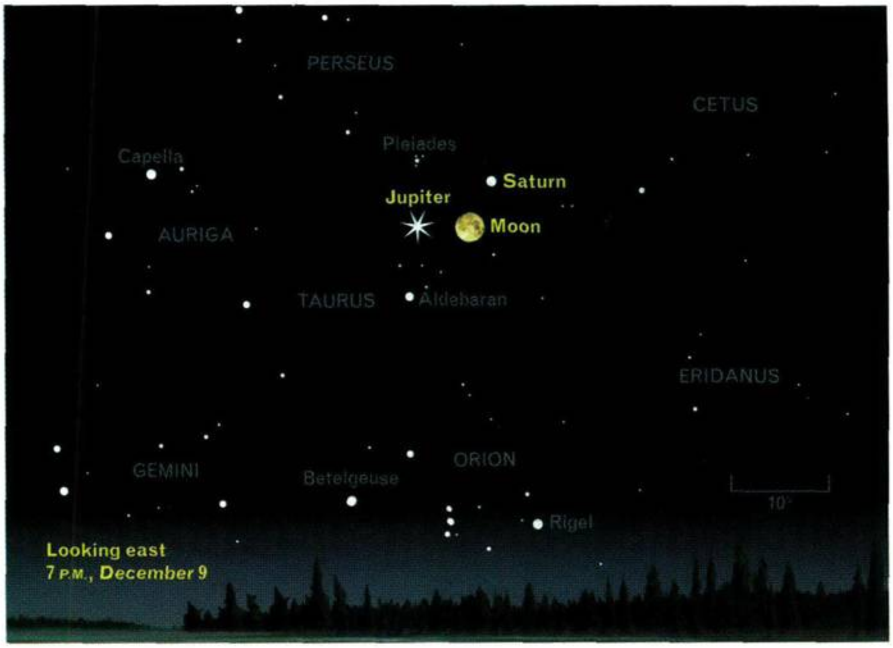
Three brilliant planets dominate our evening skies in December. **Jupiter** and **Saturn** continue their wonderful apparition in Taurus the Bull. **Venus** also commands attention for a few hours after sunset, putting on a dazzling display and capturing attention during the drive home from work.

The first evening of December opens with a beautiful crescent moon hanging above the southwestern horizon. By 6 P.M. local time the sky should be dark enough to see Venus 23° west of the moon. On December 29 the moon stands a little more than 2° above Venus, creating a lovely spectacle worth photographing. All you need is a camera with a "B" (bulb) setting mounted on a tripod. Plan carefully, placing some foreground trees within the picture to create a silhouette effect, and shoot off a few pictures from 5 to 30 seconds in duration. Check to make sure the camera is focused at infinity and set it at an aperture of f/2.

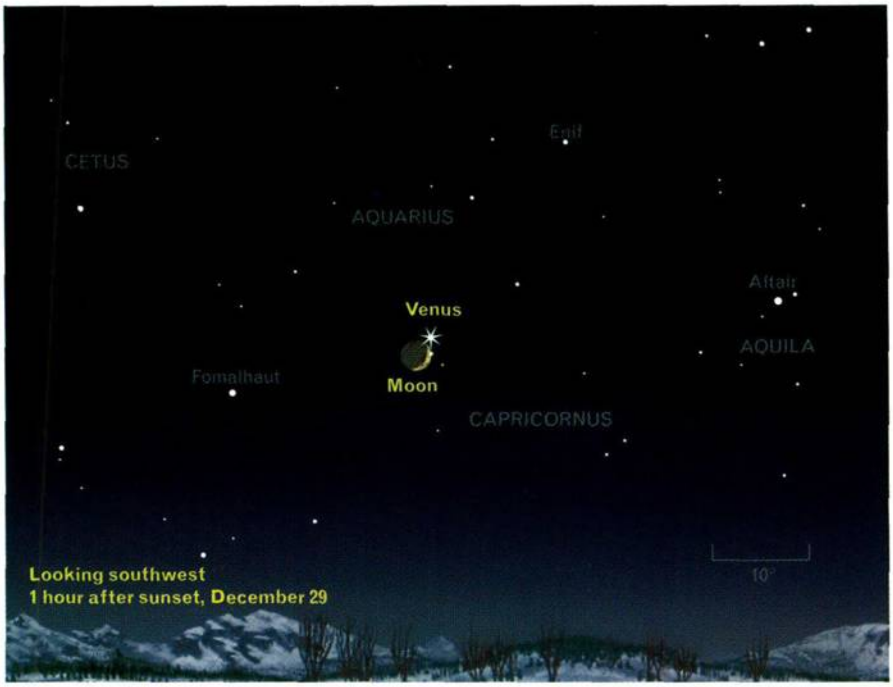
During the following week the moon climbs higher in the sky when viewed at the same time each night, and its phase increases, becoming a full moon on December 11.

Venus also continues to climb away from the sun. On December 1 it sets three hours after the sun and lies 42° to the east. By the end of the year Venus has increased its elongation to 46° and sets almost four hours after the sun, remaining visible above the western horizon until almost 9 P.M. local time. Venus reaches a magnitude –4.3 by the 25th, not far from its potential maximum of –4.7.

Telescopic viewing of Venus through the month will show its phases shrinking from 70 percent to 60 percent. At the same time its distance from Earth shrinks from 94.5 million miles to 76.2 million miles, resulting in an increase in its apparent size from 16" to 20". Few other features are typically visible — the entire planet is shrouded by a thick, reflective atmosphere. Experienced observers of the planet have seen occasional dusky shadings, but they tend to be rare and elusive.



Looking east
7 P.M., December 9



Looking southwest
1 hour after sunset, December 29

An hour after sunset, once the sky is sufficiently dark, Jupiter and Saturn hang above the eastern horizon opposite Venus in the sky. Saturn leads the pair but is the dimmer of the two. The Ringed Planet, just past opposition, lies in Taurus the Bull only 7° south of the stunning naked-eye star cluster the Pleiades, or Seven Sisters. Saturn fades this month as its distance from Earth increases, and it shines at magnitude –0.1 by month's end. Saturn is a "must-see" this winter. Amaze your friends with a view of the majestic rings through your telescope. The rings stretch double the planet's girth and are *tilted by 23°* — with the south pole of the planet on full view. Point out to your friends the brightest moon of Saturn, Titan. Tell them that in four short years, the Cassini spacecraft will arrive at Saturn and send a probe plunging into the depths of Titan's atmosphere. Titan can be found circling the planet every two weeks. It lies due north of the planet on December 5 and 21 and shines at magnitude 8.3.

Following your view of Saturn, turn to Jupiter. Its size will stun you — the disk is double that of Saturn's, and the remarkable detail in its cloud belts compared to Saturn's relatively bland appearance will surprise you. It also shines 13 times brighter than Saturn at magnitude –2.8. The Great Red Spot, dark and bright plumes and hollows, and disruptions in the dark equatorial belts are frequently on view. The equatorial belts are most obvious to the casual viewer; other features take more patience and careful viewing of the planet over many minutes. Disturbances in Earth's atmosphere blur features on the planet, and moments of good seeing are worth the wait.

Jupiter stands 6° northwest of Aldebaran, the brightest star in Taurus the Bull, and slowly moves farther west throughout December during its retrograde motion. Watch for the nearly full moon on December 9, as it forms a triangle in the sky with Jupiter 5° to its northeast and Saturn 5° to its west. Jupiter's disk diminishes slightly in size by the end of December, reaching 47". Its four principal moons shift nightly as their various orbital speeds carry them around the giant planet. Io takes only two days to make one orbit of Jupiter compared to outermost Callisto's two weeks. If you have an illuminated reticle eyepiece, you could use the graduated scale to measure the relative distance of each moon from night to night and plot the positions to calculate their orbital periods.

The other two large planets, **Uranus** and **Neptune**, are briefly on view in the early evenings. The moon passes 2.5° south of Neptune on November 30, and the following night it passes 3° south of Uranus. Neptune is very dim and will be difficult to see in the evening twilight, but two hours after sunset Uranus will be an easy binocular object if you have a clear western horizon. It shines at magnitude 5.9 and is in the same binocular field of view as Iota (ι) Capricorni, a magnitude 4.3 star in northeastern Capricornus the Sea Goat. The best date to catch Uranus is when Venus lies close by. Venus passes 1.2° south-southeast of Uranus on December 24.

Mars rises shortly before 3 A.M. local time in late December and can be found among the stars of Virgo the Maiden. The 1st-magnitude star Spica lies 5° west of the Red Planet. On December 20 a crescent moon joins the group, passing 4° to the north-northeast of Mars. It will be a few months before Mars is worth looking at with a telescope. Currently it is a mere 5" across. It is slowly heading for opposition in June 2001.

Venus perches above this barren tree in the evening twilight. Andrew Cottam

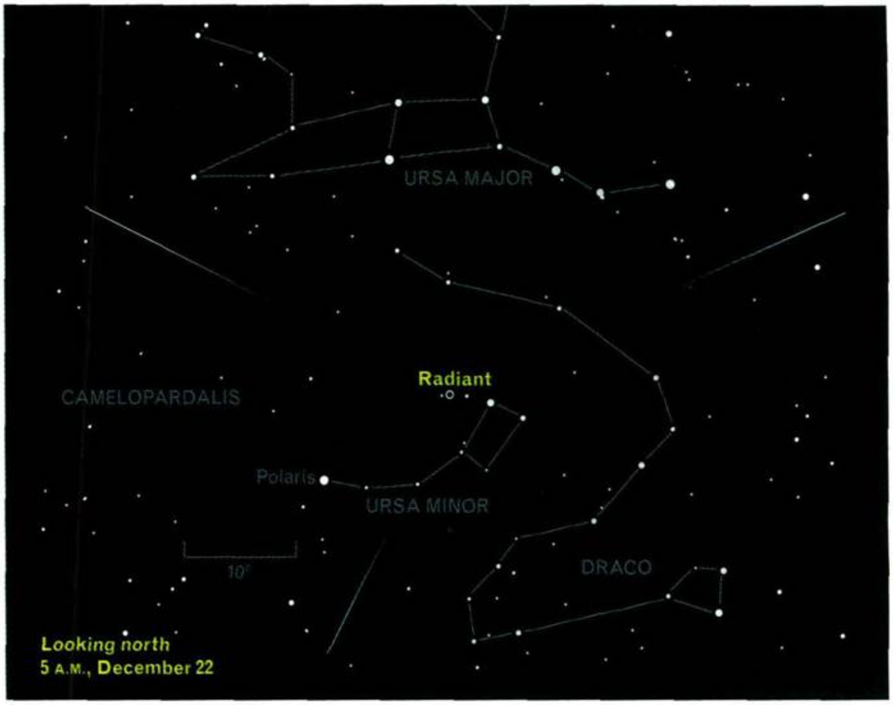
Meteors and Moons

So-so Geminids

This strong annual shower peaks on December 13 and has bright moonlight interfering with viewing its activity. Usually people see about 120 meteors per hour during the Geminids, but the moon will blot out many of these this year. The shower produces bright meteors, however, and monitoring its activity could be worthwhile.

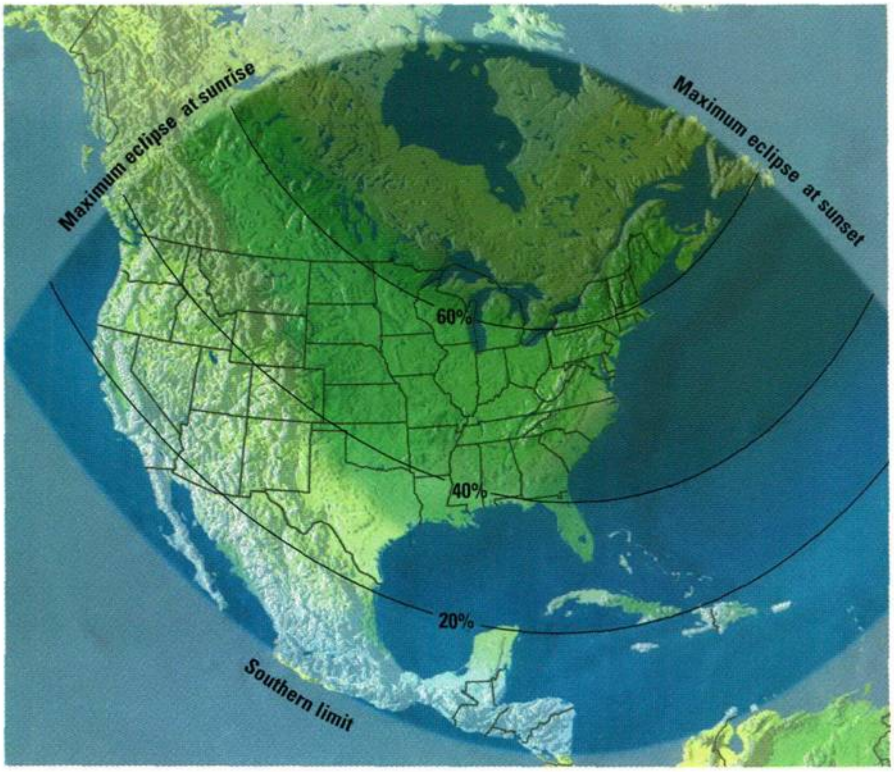
Ursids Make a Good Showing

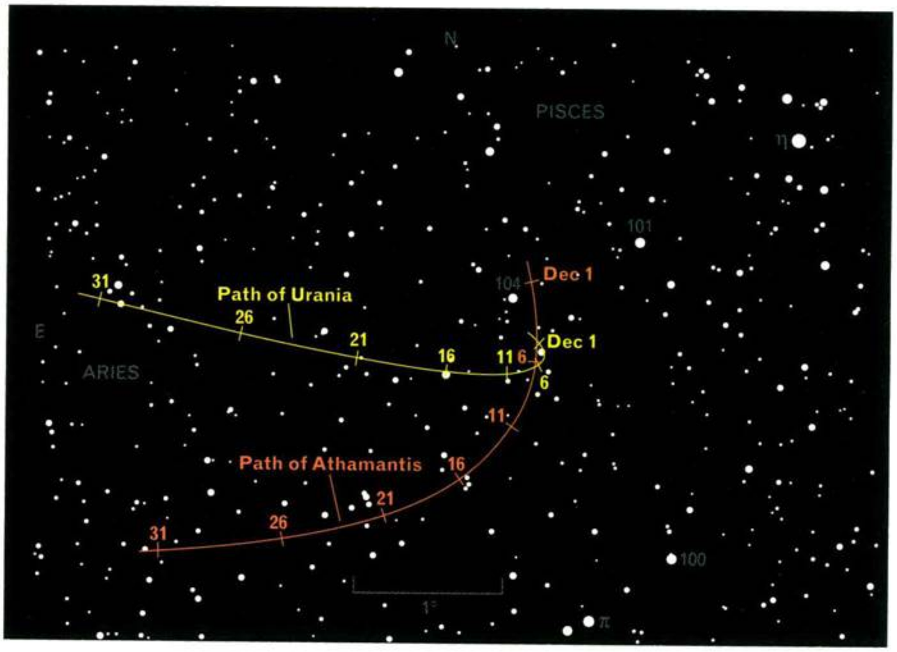
With a more favorable position of the moon than the Geminids, the Ursids peak within three days of new moon and promise to be a fine event. Enhanced activity of the shower was reported in 1988 and 1994, with zenithal hourly rates reaching near 50 per hour. Normal activity is around 10 per hour. (Zenithal hourly rates are the number of meteors expected to be observable by an individual if the sky was perfectly clear and the radiant was directly overhead. The ZHR gives a standardized way of comparing shower rates). With such favorable conditions it will be interesting to see what this year offers. The meteors are relatively slow moving and many are quite faint. The dark skies of late December will help their visibility. The radiant lies close to Kochab, the second brightest star in the northern circumpolar constellation of Ursa Minor the Little Bear, or Little Dipper.



Partial Solar Eclipse on Christmas

This month's new moon occurs near one of the nodes where its orbit crosses the ecliptic, resulting in an eclipse. On December 25, one of the best partial eclipses in many years can be seen from all of North America. A detailed eclipse summary from the November issue can also be found at our webiste, Astronomy.com. The eclipse begins in the mid-morning for the East Coast, early morning in the west, and peaks near noon for observers on a line between Lake Erie and Georgia. Observers in Chicago, for example, will experience the maximum eclipse at 11:17 A.M. local time, and the sun will be 25° above the southern horizon. The eclipse, which never reaches totality, should not be viewed directly without protection because the sun's intense light can blind you. View it by projecting an image onto a white screen or card or using eclipse glasses from a reputable supplier or from the insert in January's issue. *Do not use this month's 3-D glasses for observing any eclipse!*





Asteroids that Pass in the Night

Two rocky denizens appear in the same field of view this month, and in a high-power view they seem to crisscross in a near collision.

Early in the month, 30 Urania and 230 Athamantis, both at 10th magnitude, come within 3' of each other. That's less than five apparent disk diameters of Jupiter. Observers in the Eastern Hemisphere can see them only 1' apart on the night of December 6/7. Earlier, on the evening of the 3rd, watch Urania pull away from an 8th-magnitude field star.

Although these two asteroids were discovered many years apart, they share similarities of size and reflectivity. Urania is 60 miles (100 km) across while Athamantis is a tad bigger at 70 miles (110 km) in diameter.

From our point of view the pair have a near collision, but in reality Athamantis is 18 million miles (28 million km) farther out in space than Urania. That's about 20 percent of the Earth-sun distance.

To find the duo, start near Eta (η) Piscis, the star just opposite the hockey-stick shape of Aries, then slide a bit more than 2° (4 moon diameters) to the southeast. (See the diagram above for help in locating the pair.)

Observers found Comet LINEAR to be less of a spectacle than they had hoped. Tom Normington

Comet LINEAR Fizzled

Our hopes for a nice summer comet faded as Comet LINEAR (1999/S4) began to shut down during its expected maximum. Astronomers have already begun figuring out why its dust production petered out. The comet turned out to be so small, lightweight, and crumbly that its own jet activity disrupted it. The first hints of its odd behavior surfaced when it began to move off its predicted course. All active comets have jets that produce a recoil action, but Newton's law tells us that the more massive ones can't accelerate like the lighter comets.

Suddenly, in the last week of July, astronomers witnessed the complete disruption of LINEAR's nucleus. A big comet fracturing would have produced an immense brightening from the rapid exposure of fresh snow and ice. But the diminutive LINEAR only managed a hiccup of activity. Like a poorly packed snowball, LINEAR fell apart in flight. Within a few days it became dust in the solar wind. (See http://oposite.stsci.edu/pubinfo/latest.html for images of the disruption.)

Before its fade, amateurs saw LINEAR as a binocular object from a dark sky. For sharp-eyed observers it just reached naked-eye visibility.

Martin Ratcliffe is Director of Theaters at the Exploration Place in Wichita, Kansas. Alister Ling is a meteorologist working for Environment Canada in Alberta.

Take A Journey To The Next Dimension.

{You're Almost There.}

If you think peering into these depths is intriguing, try your eye at the wonders of space and time as seen through the power of a NexStar® telescope from Celestron®. ● These earthly wonders are the easiest and most advanced tools to locate, track, and study those naturally dimensional marvels of space. Indeed, NexStar telescopes are light years ahead of other computerized "Go-To" telescopes, due in part to an amazing Auto-Align feature containing thousands of pre-programmed celestial sights that will have you up and observing in no time. There's even a communication port so you can control the NexStar from your personal computer. ● Take the NexStar 60 series for example. These 60mm refractors come with either a directional hand control or fully computerized hand control with a database of up to 4,000 celestial objects. It includes three 1¼" eyepieces for magnifications of 35x, 70x, and 175x, as well as ***The Sky Level 1*** CD-ROM software, plus a pre-assembled, adjustable aluminum tripod. ● The NexStar 80 series, featuring an 80mm aperture, is a wide field explorer with a 3.25° field of view capable of capturing the largest deep sky objects. This short tube, 400mm focal length refractor telescope takes you into space with a 16x and 40x magnification eyepiece. The pre-assembled tripod and quick-release coupling knob make this the most portable of the NexStar line. ● The Nexstar 114 reflector telescope boasts 265 times the light-gathering power of the average human

NEXSTAR 80

NEXSTAR 60

NEXSTAR 114

©2000 Celestron International

NEXSTAR 5

eye, revealing fine detail within galaxies and nebulae. This compact model brings objects into view with a 114mm aperture and 1,000mm focal length capable of achieving magnifications of 40x and 100x with the standard eyepiece. ● Step up to the NexStar 5 for Schmidt-Cassegrain 5" optics with Starbright™ multi-coating, a premium 1¼", 25mm Plössl eyepiece, a f/10 focal ratio and 1,250mm focal length. It can even be used as a spotting scope or 1250mm telephoto lens, and is perfectly suited for astrophotography. And its computerized features include Auto-Align, a tour function, a database of over 18,000 celestial objects, an easy-to-use hand control and a serial port for PC connection.

● Finally, the NexStar 8 comes with all the standard features of the NexStar 5, but adds Celestron's famous 8" optics with Starbright multi-coating, making it possible to offer images twice as bright as a 5" telescope.

NEXSTAR 8

● To learn more about Celestron's NexStar telescopes, visit us on the web at **www.celestron.com**. Or call (310) 328-9560 to find the NexStar dealer in your corner of the galaxy.

QUICK & EASY ASSEMBLY

FULLY ASSEMBLED TRIPOD

MOUNT SLIPS EASILY INTO TRIPOD HEAD

READY TO GO!

ACCESSORIES INCLUDED

COMPUTERIZED MULTI-SPEED HAND CONTROLLER

STARPOINTER ADVANCED RED DOT LED FINDERSCOPE

THE SKY LEVEL 1 CD-ROM

natural wonders
Curious Minds Find Answers at Natural Wonders

SHOP ON LINE AT www.naturalwonders.com
CALL 1-800-2-WONDER FOR A STORE NEAR YOU

CELESTRON

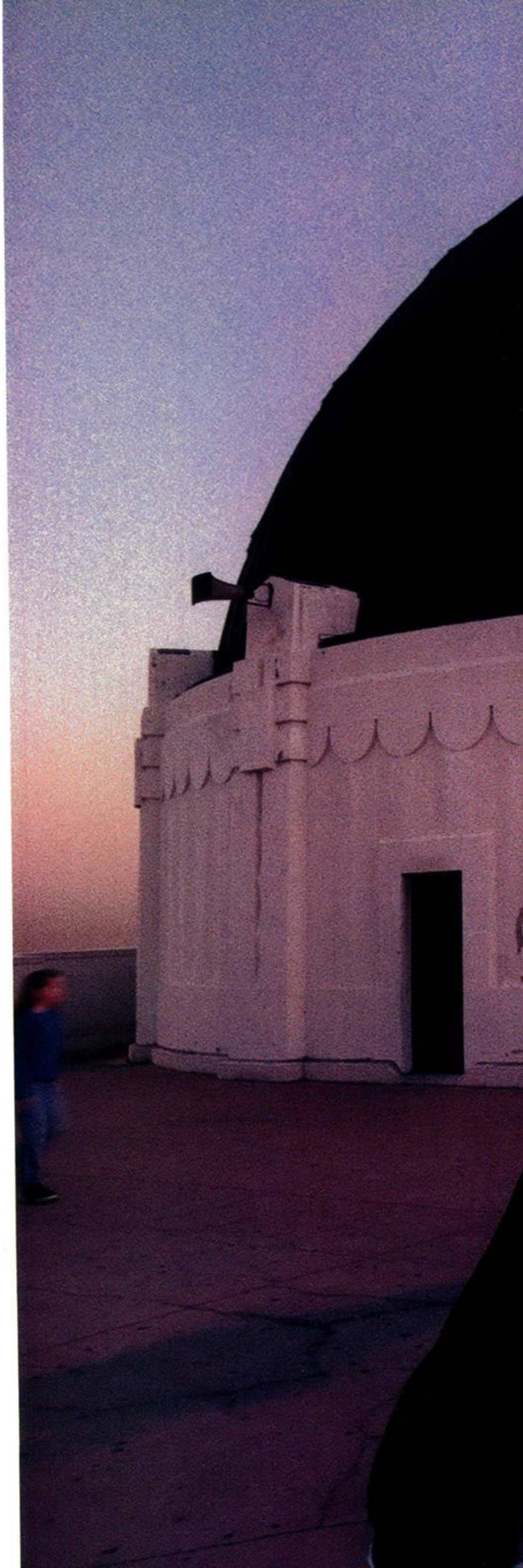
Stars Shine over Tinseltown

*It's said that the lights from
Los Angeles overpower the stars.
Don't believe everything you hear.*

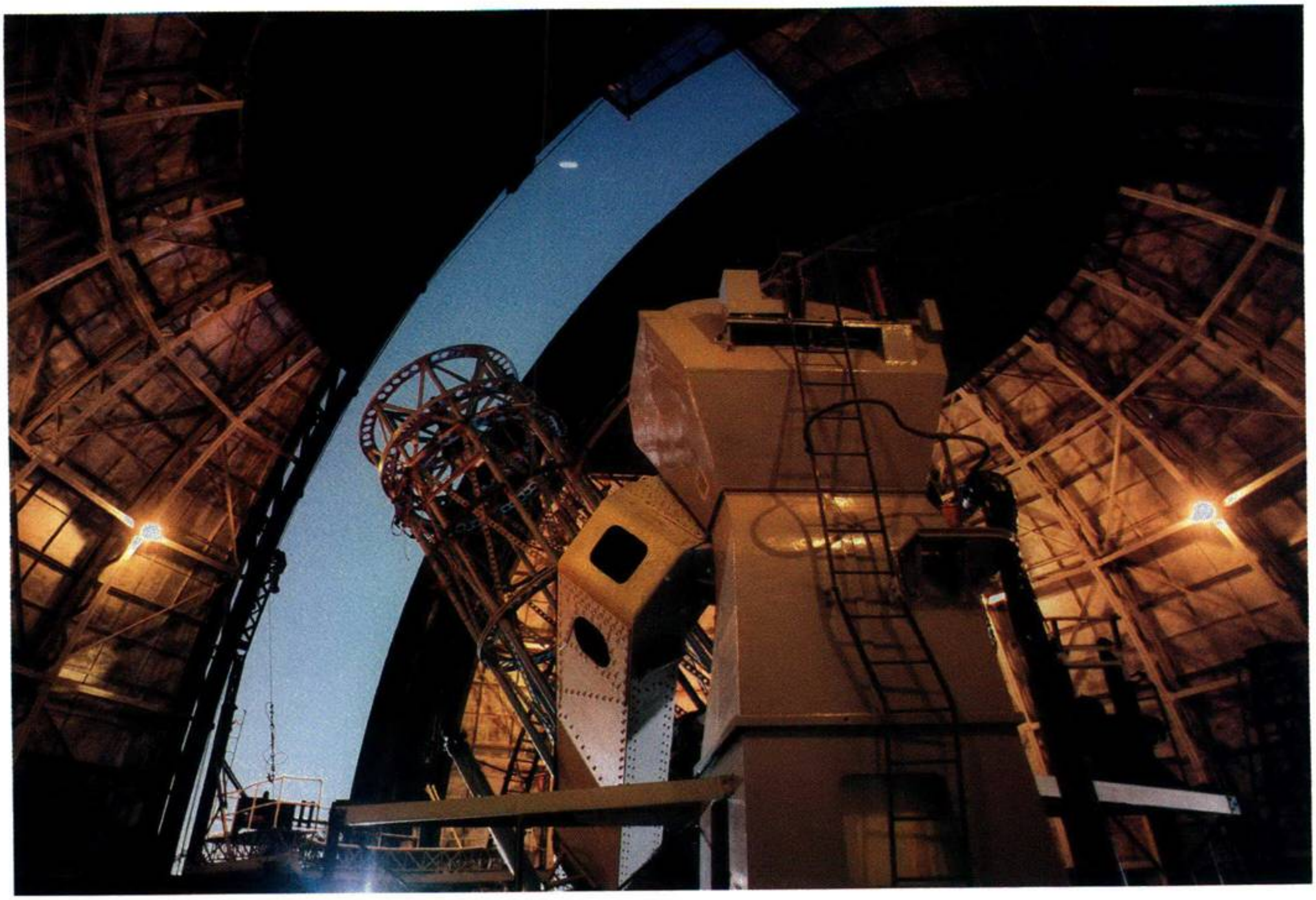
by Patricia Kurtz

I love Los Angeles. There's something magical about a place that sits on the edge of a continent. There's something endearing and resilient about people who leave emergency bags next to their doors "just in case" nature decides to shake things up — again.

Geography and seismology aside, where else do stars shine as brightly as the celebrities in Hollywood? Billboards that glitter on the freeways advertise upcoming films. Not long ago, traffic on Interstate 405 came to a halt when commuters thought a hole had been blasted into a building due to a realistic advertisement



Like the *roofline* of an ancient temple, the dome of Griffith Observatory invites residents, tourists, and moviemakers to sunset on the grounds. Raleigh Souther



The 100-inch Hooker telescope that Hubble used to expand the universe still works hard at Mt. Wilson. Raleigh Souther

for *Armageddon* painted on its side. The painting was subsequently removed, but building-sized advertisements are all the rage. Finally, let's not forget the freeways. There are more than 25 freeways to get lost or beached on. Even resident Angelenos don't negotiate the city without the one-inch thick Thomas Guide or another exceptional map. With the razzle-dazzle of Universal Studios, Hollywood, shopping malls, and a population exceeding 9.6 million, the glaring lights of the area must completely overwhelm the stars, yes?

No, not completely. Stars do smile on the City of Angels.

Using a few tips from stargazers there, anyone can see them. I traveled the skies with expert astrophotographers, perused the fabled halls of Griffith Observatory, and almost froze in summer atop Mt. Wilson. Space is clearly the primary focus at NASA's Jet Propulsion Laboratory nestled in the hills near Pasadena, and the astronomical societies in the area have many dedicated members who are happy to point you in the right direction. If you aren't seeing stars, you're simply not looking.

Skyshooters Aim for the Stars

Some of the world's finest astrophotographers live in and shoot from California. Granted, they aren't downtown, but they're close enough to understand the Big City Blues. Tony and Daphne Hallas, Bill and Sally Fletcher, and Martin Germano live in Los Angeles County and have watched the increasing population explosion take a drastic toll on once-dark skies.

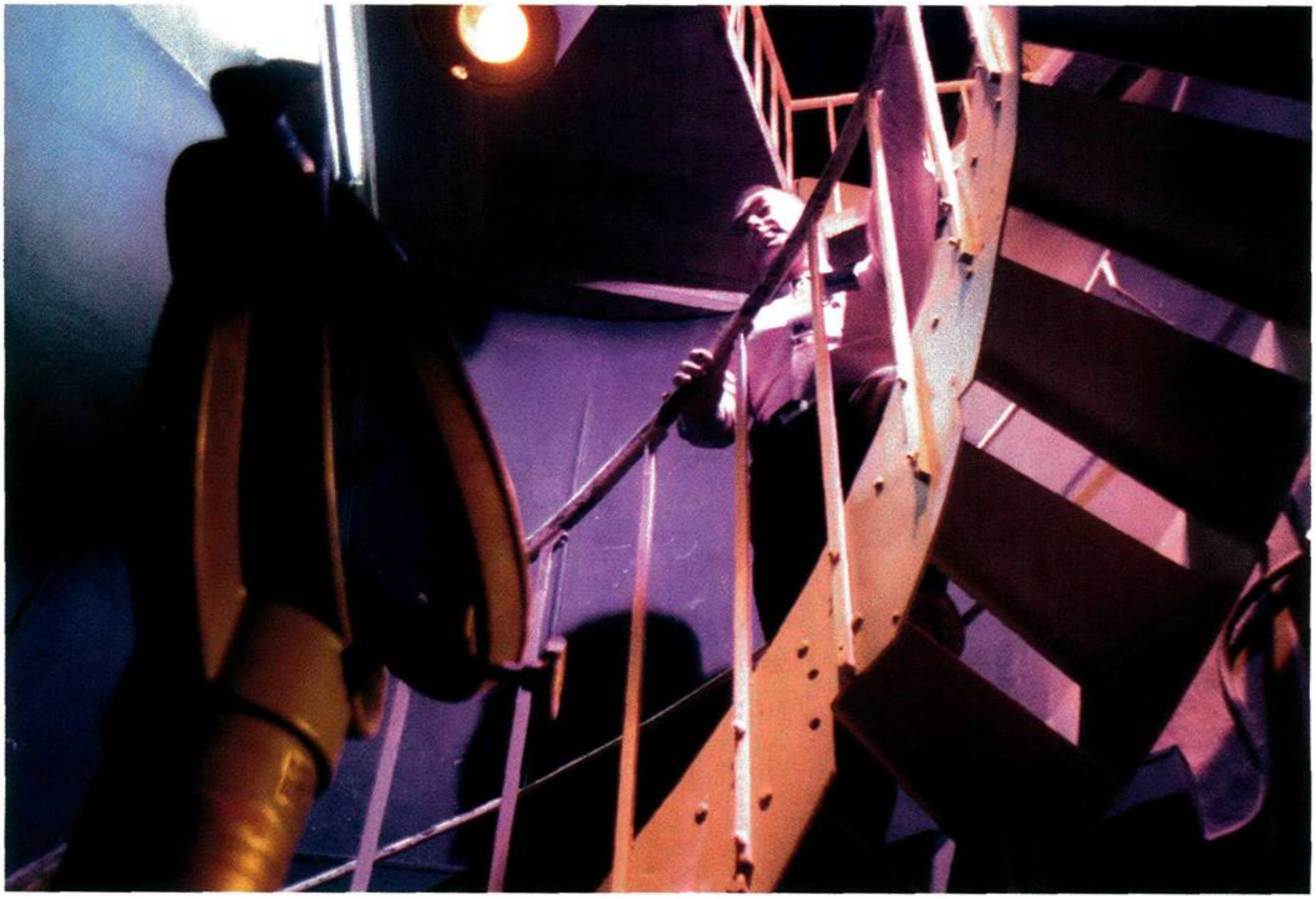
The Hallases bemoan the loss of dark skies from their beloved 8,300-foot Mt. Pinos, located about 100 miles from Los Angeles. Now they travel about 150 miles northeast to get away from the light dome that saturates the area. However, when conditions are right, Mt. Pinos is still a respectable site. Californians sometimes get big help from the state's unusual atmospheric conditions. Hallas and other stargazers in the area watch for Tule, or ground fog, and a good marine layer of clouds that blanket the valleys below. These enterprising folks watch the tops of the cloud layers so they can get above them when fog rolls in from the ocean and blocks the lights.

Other area astronomers, such as those in the Orange County, Riverside, and Los Angeles Astronomical Societies, pack up their gear and head for the desert. Joshua Tree National Park extends over 794,000 acres about 140 miles east of Los Angeles. The park "spans the transition between the Mojave and Colorado deserts of Southern California," according to the National Park Service. The skies are usually clear and the humidity low.

Above the Clouds on Mt. Wilson

If a stargazing trip to the desert doesn't fit in your itinerary, a day trip to Mt. Wilson Observatory might be just what the tour guide ordered. This adventurous experience includes 19 miles of winding roads that launch onto five miles of arduous switchbacks and hairpin curves. It's definitely worth the ride, but be forewarned — avoid looking down until you've reached the top.

Perched 1,742 meters above the Pacific Ocean in the San Gabriel Mountains, Mt. Wilson hosts several ongoing astronomical projects. Although its proximity to Los Angeles



Griffith Observatory's Robert Braden shows off the inner workings of the solar telescope. Raleigh Souther

limits optical observing, some point sources such as stars and star clusters, nearby galaxies, and the solar system make decent targets. One group of researchers is measuring the chromospheric activity of cool stars with the 60-inch telescope built by George Ellery Hale in 1908. When it was built it was the world's largest telescope.

The sky brightness, which approximates conditions during a full moon, does not interfere with sun watching at the two solar observatories. Using a 60-foot tower telescope, astronomers study wavelike motions of the sun's visible surface to learn about its hidden interior. The 150-foot tower telescope is used to investigate long-term changes in solar magnetic activity.

Because atmospheric seeing atop Mt. Wilson is steady and frequent marine layers wash into the Los Angeles basin, clear, crisp images are possible over the clouds. These inversion conditions are exploited with the three onsite interferometers and adaptive optics. Finally, a 24-inch telescope and the Snow Solar Telescope are used by Telescopes in Education (TIE) to bring astronomy into classrooms around the world.

Spectacular views of central Los Angeles and Glendale are waiting for you from the top of Mt. Wilson, and on a clear day, you can see the ocean and some islands offshore. The green flash is frequently observed at sunset. Local astronomy clubs and the Mount Wilson Observatory Association regularly organize star parties on the mountain.

A public walking tour features a look at all the science facilities on the mountain, including the astronomical museum and the library (built to withstand earthquakes and forest fires), according to Gil Clark, director of the TIE program. Call Mt. Wilson at 626-793-3100 for more information before taking the trip to the top. Or, if mountain roads aren't your favorite thing, make advance arrangements for a cosmic rocket stop in Pasadena.

Tour Outer Space at JPL

If a single organization has done more for space exploration than the Jet Propulsion Laboratory (JPL), I don't know what it is.

Its beginnings take us back to the 1930s when Caltech professor Theodore von Kármán conducted pioneering work in rocket propulsion. Several wars, two decades, and many rockets later, JPL was transferred in 1958 from Army jurisdiction to the then-new civilian space agency, NASA. It brought its experience in spacecraft technology and telecommunications to the party, and in the 1960s JPL began to conceive and build robotic spacecraft with which to explore new worlds. It continues to make history on a daily basis.

Located at the foot of the San Gabriel Mountains near Pasadena, JPL is managed for NASA by the California Institute of Technology. It is home to many missions but is considered to be the leading U.S. center for robotic exploration of our solar system. Its spacecraft are responsible for gathering most of our knowledge about all known planets in the solar system except Pluto, and a mission to Pluto is planned for early in this decade.

If you know you're going to be in the Los Angeles area and want to tour JPL, be sure to give them notice. Reservations are required for all tours, and group tours are usually booked

Getting Around

Mt. Wilson Observatory
(www.mtwilson.edu)
Public hours — weekends: 10 A.M. to 4 P.M., weather permitting
On-site Walking Tour: 1 P.M. at the Pavilion on Saturdays, Sundays, and holidays during the period of Daylight Savings Time.
Telescopes in Education Project (http://tie.jpl.nasa.gov)

JPL
(www.jpl.nasa.gov)
Tours are arranged through the Public Services Office, Jet Propulsion Laboratory, 4800 Oak Grove Drive, Mail Stop 186-113, Pasadena, CA 91109; (818) 354-9314; Fax: (818) 393-4641.

Griffith Observatory
(www.GriffithObs.org)
Open until mid-2001 when the observatory will be closed *two years for major renovation.*
Call for more information and schedules:

(232) 664-1191	Program Information
(232) 663-8171	Weekly Sky Report
(232) 664-1181	Observatory Office

Astronomical Society of the Desert
(www.astrorx.org)
e-mail, esnyder@dccd.cc.ca.us

Los Angeles Astronomical Society
(www.laas.org/index.html)
(232) 673-7355, LAAS c/o Griffith Observatory, 2800 East Observatory Road, Los Angeles, CA 90027-1299

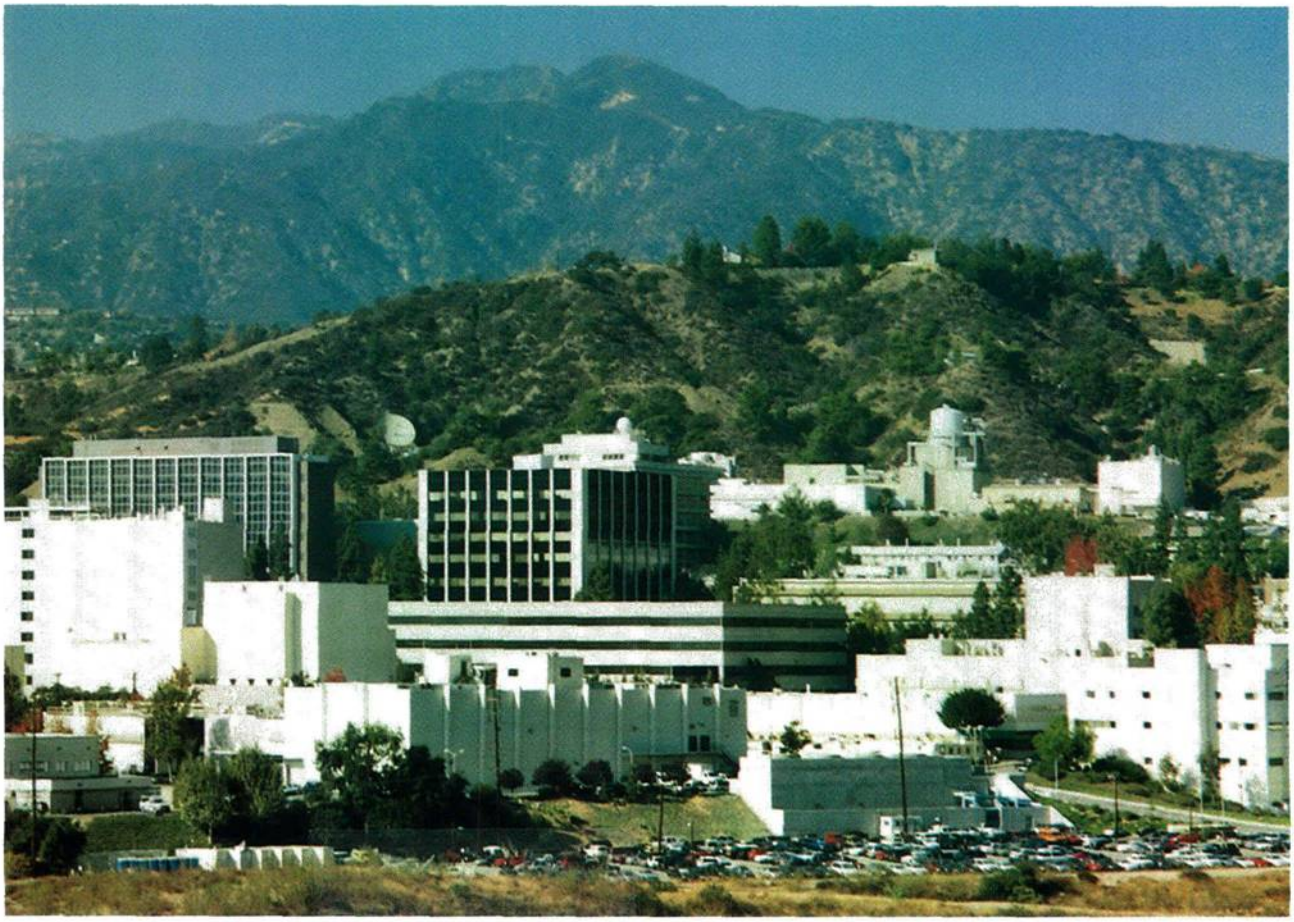
Los Angeles Sidewalk Astronomers
(www.SidewalkAstronomers.com)
1946 Vedanta Place, Hollywood, CA 90068

Mt. Wilson Observatory Association
(www.mwoa.org); P.O. Box 70076, Pasadena, CA 91117-7076, e-mail, info@mwoa.org

Orange County Astronomers
(www.chapman.edu/oca)

Riverside Astronomical Society
(www.pe.net/~wpl/ras.html)

Ventura County Astronomical Society
P.O. Box 982, Simi Valley, CA 93062, (805) 529-7813



Jet Propulsion Laboratory, Pasadena, California/Robert Naeye six months in advance. Individual and family tours require four- to six-weeks notice.The comprehensive tour includes a multimedia presentation titled "Welcome to Outer Space" and visits to the Space Flight Operations Facility, which holds the mission control area, the Spacecraft Assembly Facility, and the Spacecraft Museum.

Griffith Romances the Stars

You don't need to phone ahead for a commanding view of the city from Griffith Observatory. A trip there at sunset is required for any self-respecting tourist, astronomer or no.

More than 50 million people have visited Griffith since it opened its doors in 1935. A generous gift from Griffith J. Griffith in 1896 made it possible, and it's administered by the city of Los Angeles Department of Recreation and Parks. Griffith Observatory houses a planetarium, telescopes, and a science museum within a grand structure. Your first view inside the building will no doubt be the 40-foot Foucault Pendulum swinging from a dramatic dome in the ceiling. Original Hugo Ballin murals are stitched into the side of the dome representing mythological stories and beings; other murals represent fields of science.

The museum focuses on general science, an approach begun in the 1930s when the observatory opened. "You would have seen displays on magnetism and electricity, for instance. We've mainly targeted astronomy in more recent years," said our museum guide Robert Braden.

The Hubble Exhibit, provided by Lockheed, sports an 8-foot replica of the Hubble Space Telescope. A mechanical moon-phase exhibit shows an orbiting moon as it goes through its phases. Hands-on exhibits abound with meteorite displays, computer quizzes, and stargazer exercises. People on the front lawn wave to their friends observing them inside through the camera obscura. This gives museum volunteers the opportunity to explain optics to patrons and inspire kids to make their own box cameras.

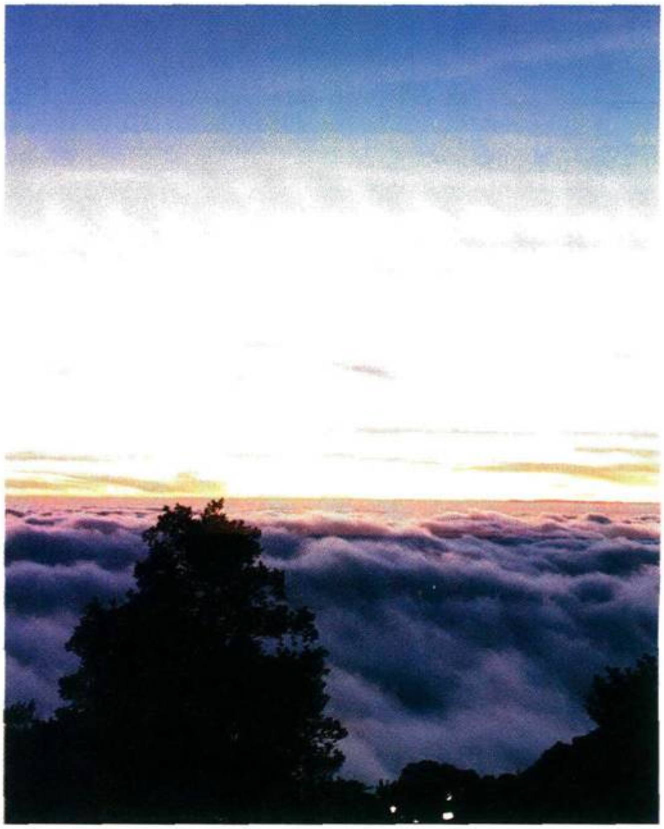
The highlight of the museum for me sat in the west hall — a triple beam solar telescope that projects a live image of the sun, complete with sunspots, on a screen inside. Look through an eyepiece next to the scope, and a hydrogen-alpha filter makes solar flares visible.

"Every local college professor knows about the research-grade equipment up here and sends pupils in with assignments," said Braden.

A substantial renovation in the next several years should help the observatory "preserve the stars like an endangered species for a community that long ago lost touch with the night," says Griffith director E. C. Krupp. The observatory will be closed in mid-2001 for the renovation, and plans call for it to be completed in two years.

All systems and elements of the observatory will be brought back to their original grandeur and improved for the current level of public use. A new state-of-the-art theater, an expanded observatory, and an additional auditorium will provide more space for public programs.

But the inside of the observatory isn't the only reason people flock to Griffith. Picnickers lunch on the front lawn, hikers park their cars here before tackling Mt. Hollywood, and parents and children throw Frisbees to each other around the grounds. How many places in Los Angeles are surrounded by 4,000 open acres? "People come to smooch along the railing here at the lookout and watch the sunset," said Braden, who proposed to his wife on the observatory roof.



When the fog rolls in, California amateurs rejoice. They drive into the local mountains above the marine layer that blocks the lights of Hollywood so they can view a dark sky. Mt. Wilson Observatory/ Colleen Gino

Griffith has also often served as a television and movie set. A well-remembered scene from *Rebel Without a Cause* was filmed in the theater, *Terminator* came to life outside the hallowed halls, and several scenes from *Murder She Wrote* were filmed here. It's a popular backdrop for still photography as well; the famed Hollywood sign is visible from the terrace.

The Griffith staff seeks opportunities to throw star parties on the front lawn. After a spectacular sunset, a planetarium lecturer can be heard throughout the museum gathering people and herding them outside to watch for iridium flares.

Typically for hosting star parties, Griffith relies heavily on the generous hearts and equipment of groups such as the L.A. Astronomical Society, the Orange County Astronomers, and the L.A. Sidewalk Astronomers. These organizations host large numbers of people and help Griffith's staff spread the word about the night sky. Every night, as twilight settles to dark, the 12-inch Zeiss refractor is unveiled for all to use.

Yes, light pollution continues to grow unabated in Los Angeles. Attempts by some communities to limit the wavelength of some lights placed in public areas help, but the task of curbing the spread of humanity and its lighting seems insurmountable. The attraction to California is understandable. It's not hard to take the palm trees, flowers, Pacific Ocean sunsets, and average temperatures of 75 to 80 degrees. If you've taken our stargazing tips to heart, and you're still not seeing stars, you can always try the restaurant Spago. ■

Patricia Kurtz, a freelance writer and website designer living in Littleton, Colorado, is a contributing editor for Astronomy.

ORION
TELESCOPES & BINOCULARS

Hundreds more products online!
telescope.com

Our 25th Year!

TELESCOPES

Orion SkyQuest™ XT Dobsonian Telescopes

Big Aperture, Superior Performance, Point-and-View Simplicity

For a fraction of the cost of a little "go to" scope, you can own a telescope with serious *aperture*. See more of the universe—for less—with an award-winning SkyQuest XT metal-tube Dobsonian. It'll keep you up nights.

ENAMELED STEEL TUBE, NOT CARDBOARD!

New!
New!
SkyQuest
SkyQuest
SkyQuest
SkyQuest
ORION
ORION
ORION

SkyQuest XT4.5
Just the right size for younger stargazers, and incredibly easy to master! Adults will love it too, for its portability and crisp optical performance.
Steel tube, 114mm mirror (f.l. 910mm, f/8), 1.25" R&P focuser, 6x30 achromatic finder scope, 25mm (36x) and 9mm (110x) Plössl eyepieces (1.25"), 5" flanged altitude hubs, CorrecTension Friction Optimization, built-in handle, dust cap. Weight: tube 9 lbs., base 8-1/2 lbs.

$199

SkyQuest XT6
The overachieving XT6 will show Jupiter's Red Spot, Saturn's Cassini Division, hundreds of clusters and nebulas, and galaxies tens of millions of light-years distant. Nicely portable and very affordable!
Steel tube, 152mm parabolic mirror (f.l. 1200mm, f/8), 1.25" aluminum R&P focuser, 6x30 achromatic finder scope, 25mm (48x) and 9mm (133x) Plössl eyepieces (1.25"), Moon filter, eyepiece rack, 5" flanged altitude hubs, CorrecTension Friction Optimization, dust cap. Weight: tube 13 lbs., base 24 lbs.

$369

SkyQuest XT8
The XT8's prodigious performance on both solar system and deep-sky denizens have made it the telescope of choice for thousands of astronomers, from beginners to die-hard hobbyists.
Steel tube, 200mm parabolic mirror (f.l. 1200mm, f/6), 1.25" aluminum R&P focuser, 6x30 achromatic finder scope, 25mm (48x) and 9mm (133x) Plössl eyepieces (1.25"), Moon filter, eyepiece rack, 5" flanged altitude hubs, CorrecTension Friction Optimization, dust cap. Weight: tube 19 lbs., base 23 lbs.

$499

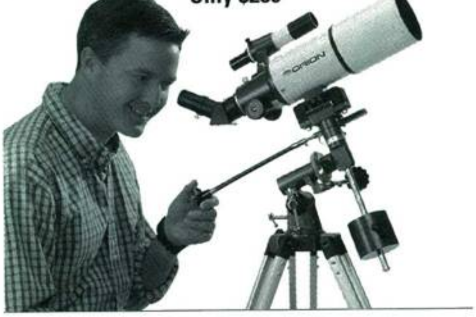
SkyQuest XT10
Gulping in over 50% more light than an 8" scope, the XT10 reaches far deeper into space. The sheer number of objects visible in this scope is staggering, and its resolving power brings out detail that will keep you entranced for years.
Steel tube, 250mm parabolic mirror (f.l. 1255mm, f/5), 2" aluminum R&P focuser, big 8x50 achromatic finder scope, 25mm (50x) and 9mm (139x) Plössl eyepieces (1.25"), Moon filter, eyepiece rack, 5" flanged altitude hubs, CorrecTension Friction Optimization, dust cap. Weight: tube 35 lbs., base 23 lbs.

$649

Orion ShortTube™ 80mm EQ

Our popular ST80 is now available in a portable equatorial package. Super easy to set up, carry, and operate. Its 80mm aperture serves up bright, expansive gulps of sky. The EQ-1 equatorial mount has manual slow-motion controls and accepts an optional EQ-1M electronic drive. Adjustable aluminum tripod with accessory tray. Accessories include a 6x26 correct-image finder scope, correct-image 45° diagonal, and two Explorer II eyepieces (1.25"): 25mm (16x) and 10mm (40x). Comes with 1/4"-20 adapter for coupling tube assembly to mount. Focal length 400mm (f/5).

Only $289



Orion Skywatcher 90mm EQ Refractor

Enjoy clear, sharp images of the Moon, planets, double stars, and bright deep-sky showpieces for only $339 complete. Multi-coated, 90mm achromatic objective lens (910mm focal length, f/10) in all-aluminum tube. Includes the sturdy EQ-2 mount, which accepts an optional electronic drive. Also comes with a 6x30 finder, mirror star diagonal, 25mm (36x) and 10mm (91x) Kellner eyepieces (1.25"), and aluminum tripod with accessory tray.

Was $359 **Now $339**

New Lower Price!
ORION

Orion SkyView™ Deluxe EQ Series

Telescopes for *Today's* Amateur Astronomer

SkyView™ Deluxe 8 EQ Newtonian

A deep-sky lover's delight! Big, diffraction-limited 200mm parabolic primary mirror of 800mm focal length (f/4) delivers vivid, wide-field views of nebulas, clusters, and galaxies. Gathers 73% more light than a 6" scope, yet is nicely portable. Enameled steel tube and aluminum R&P focuser (1.25").

$649

SkyView™ Deluxe 6 EQ Newtonian

Outstanding for deep-sky and planetary/lunar study. Features a precision 6"-diameter **parabolic** primary mirror and aluminum R&P focuser. Enameled steel optical tube. Focal length 750mm (f/5).

New Lower Price! Was $529 **Now $499**

SkyView™ Deluxe 4.5 EQ Newtonian

An exquisite combination of form, function, and affordability for the serious beginning astronomer. The rolled steel optical tube houses a precision-polished 4.5" primary mirror of 920mm focal length (f/8).

$388

SkyView™ Deluxe 90mm EQ Refractor

Exceptionally crisp views of the Moon, planets, and beyond! Multi-coated 90mm achromatic objective lens of 1000mm focal length (f/11.1). Seamless aluminum optical tube.

New Lower Price! Was $449 **Now $399**

Electronic Drive Compatible!

Look What's Included

- ***New heavy-duty EQ mount***
- ***TWO 1.25" Plössl eyepieces***
- ***6x30 achromatic finder scope***
- ***Moon filter (1.25")***
- ***Gold-anodized aluminum tripod***

FREE!
A $49.95 Value!
Polar-Alignment Scope

Outfit your SkyView Deluxe with an AccuTrack™ Electronic Drive for automatic star tracking.

Now $77

MONEY-BACK
If you are not completely satisfied with your purchase from Orion Telescopes & Binoculars
100% Satisfaction
for any reason, just return it in new condition within 30 days after delivery for a prompt refund.
GUARANTEE

Visit one of our California Retail Stores!

San Francisco • 3609 Buchanan St., at Bay, 1 block from Marina Safeway • (415) 931-9966

San Jose-Cupertino • 10555 S. De Anza Blvd., at McClellan; from Hwy 280, take De Anza exit; from Hwy 85 take De Anza or Stevens Creek exit • (408) 255-8770

Prices are subject to correction or change without notice.

24 Hour Toll-Free Orders: (800) 447-1001
Information/Advice: (800) 676-1343
Information Line Hours: M–F 6am–8pm, Sat. 8am–6pm Pacific Time

telescope.com

BINOCULARS

NOW WITH BAK-4 PRISMS!

Scenix™ 50mm

Newly upgraded with BAK-4 prisms for improved images. Multi-coated optics. Metal housing, not plastic. Tripod adaptable. Terrific price! Great gift.

7x50 7.1° field $77.50
10x50 WA 7.0° field $77.50

New Lower Price!

UltraView™ 50mm

Extra-long 22mm eye relief makes these superb for eyeglass wearers! Fully multi-coated optics, BAK-4 prisms. New twist-lock eyecups. Tripod adaptable.

7x50 6.5° field Was $169 **$159**
10x50 WA 6.5° field Was $169 **$159**

FULLY MULTI-COATED OPTICS!

Sale! Save $40

Vista™ 50mm

Featherlight High-Performance Binoculars. High-index BAK-4 prisms and fully multi-coated optics for high-fidelity images. Soft leatherette covering. Tripod adaptable.

7x50 6.0° field Was $219 **$179**
10x50 WA 5.3° field Was $219 **$179**

LONG EYE RELIEF!

Sale! Save $20

Mini Giant™ Binos

Compact astro binocs that show you the light! Fully multi-coated optics, BAK-4 prisms. Long eye relief (8x56: 18mm, 9x63: 26mm). Easily hand-holdable, but also tripod adaptable.

8x56 5.8° field Was $149 **$129**
9x63 5.0° field Was $199 **$179**

TRIPOD L-ADAPTER INCLUDED!

New Lower Price!

Giant 80mm

Stunning resolution of clusters, nebulas, and lunar surface detail. Fully multi-coated optics with BAK-4 prisms. Objective bridge for added rigidity. Center focus. Tripod L-adapter included. Long 15mm-16mm eye relief.

11x80 4.5° field Was $399 **$388**
16x80 3.5° field Was $399 **$388**
20x80 3.5° field Was $399 **$388**

TRIPOD L-ADAPTER INCLUDED!

Sale! Save $20

Little Giant™ II 70mm Binocular

More compact than the original Little Giants. Big 70mm objectives reveal a plethora of nebulous clouds and stellar clusterings. Great for twilight and daytime use too. Sharp, fully multi-coated optics with BAK-4 prisms. Large, knurled center focus wheel. Classic black coarse-grain finish. Tripod L-adapter, case, and deluxe wide neck strap included. Made in Japan.

11x70 4.5° field Was $259 **$239**
15x70 4.0° field Was $259 **$239**
20x70 3.0° field Was $259 **$239**

SuperGiant™ 25x100mm

Gigantic 100mm (almost 4") lenses for unbelievably detailed views of the heavens at 25x! Multi-coated optics with BAK-4 prisms. Center focus. 2.6° field of view. Platform-type 1/4"-20 mounting plate included. Comes with foam-lined aluminum case.

$1149

Sale! Save $100

INTERCHANGEABLE EYEPIECES!

80mm Binocular Telescope

An unforgettable visual experience! Uses interchangeable 1.25" telescope eyepieces, allowing wide range of powers! Includes two 25mm eyepieces (36x, 1.1° field). Mount/tripod sold separately.

Was $999 **$899**

Custom D Altaz Mount/Tripod
Shown here.
$449

EYEPIECES & ACCESSORIES

Sirius™ Plössl Eyepieces

You could pay twice the price for other brands of Plössl eyepieces, but why? Sirius Plössls are top-quality, 50° apparent-field (43° 40mm) eyepieces that yield extremely sharp images of impressively high contrast. Ideal for all types of telescopes. Fully-coated optics, rubber eyeguards.

1.25"
6.3mm, 7.5mm, 10mm, 12.5mm, 17mm, 20mm, 26mm $49.95 each
32mm, 40mm $59.95 each

.965"
6.3mm, 7.5mm, 10mm, 12.5mm, 17mm, 20mm, 26mm $49.95 each

Save Big on Sirius Sets!

Need More Than One?
Save on these practical Sirius Plössl sets. (You save on shipping, too!) 1.25" barrel diameter only.

Sirius Plössl Starter Set
And ideal "upgrade" set to replace lower-quality eyepieces, it includes three must-have focal lengths for low-, medium-, and high-power viewing: 26mm, 17mm, and 10mm.
Reg. $149 Set Price **$119**

Sirius Plössl Expansion Set
If you already have the Starter Set, or the 25mm and 10mm eyepieces included with many telescopes, this set provides three complementary focal lengths for medium and high magnifications: 20mm, 12.5mm, 7.5mm.
Reg. $149 Set Price **$119**

Sirius Plössl Power Pair
For planetary and lunar viewing especially, these 12.5mm and 7.5mm high-power oculars will have you discovering new detail. Even if you already use a 9mm or 10mm eyepiece, get this pair to add more magnification options.
Reg. $100 Set Price **$79.90**

Orion Lanthanum Eyepieces

Our rare-earth lanthanum eyepieces have new chrome exteriors but the same superior image correction and generous 20mm eye relief of the previous models. Ideal for eyeglass wearers! Fully multi-coated optics with six to eight lens elements. Apparent field 50° (7.5-25mm), 45° (2.3mm-5.2mm). Pop-down rubber eyecups. Made in Japan. 1.25" barrels.

3.8mm, 5.2mm, 7.5mm, 9.5mm, 10.5mm, 12.5mm, 14mm $109 each
2.3mm, 18mm, 21mm, 25mm $119 each

Lanthanum 65° Superwides

Combining long 20mm eye relief, an expansive 65° apparent field, and a rare-earth lanthanum lens element for superior image correction, these oculars are an astronomer's dream come true. Eight lens elements, multi-coated. Fit 1.25" or 2" focusers.

3.5mm, 5mm, 8mm, 13mm $214 each
17mm, 22mm $222 each
NEW! 42mm (2" only) $319

Padded Scope Cases

Protect your investment with a padded, polyester/nylon case. Strap handles for easy carrying. Many sizes.

From $29.95

New!

Orion LaserMate™ Collimator

Align your Newtonian's optics to get the best possible images. This compact laser collimator removes the guesswork, making the procedure quick and extremely precise. Just 3-1/3" long!

Only $64.95

DANGER
LASER RADIATION
AVOID DIRECT EYE EXPOSURE
LASER DIODE
<5mW PWR. OUTPUT, WAVELENGTH: 630-680nm
CLASS IIIA LASER PRODUCT

New Lower Price!

Aluminum Accessory Cases

Rugged and classy looking. Pre-cut, cubed foam inside to fit your specific accessories. Ample room for giant eyepieces, camera body, lots of stuff!

Medium Case Was $34.95 **$29.95**
Large Case Was $49.95 **$44.95**

ORION EZ Finder

Orion EZ Finder™

Illuminated "red dot" in nonmagnified 9° field of view shows right where telescope is pointed. Adjustable brightness. Attaches to any telescope.

$39.95

SkyGlow™ Broadband LP Filters

Improves contrast of all objects in moderately light-polluted skies.

.965" $44.95, 1.25" $59.95, 2" $109, SCT Rear Cell $89.95

UltraBlock™ LP Filters

Maximum contrast enhancement for emission nebulas.

.965" $79.95, 1.25" $99.95
2" $139, SCT Rear Cell $129

Orion Solar Filters

Catch this year's intense sunspot activity with a safe, full-aperture glass solar filter for your telescope. Sizes to fit many telescopes.

From $54.95

More than 1000 products in our print and online catalogs!

ORION
Stellar Escapes
telescope.com

ORION
TELESCOPES & BINOCULARS
P.O. BOX 1815-A, SANTA CRUZ, CA 95061

telescope.com

IT'S EASY TO ORDER!

- Call toll-free and charge to your Discover/Novus, MasterCard, or VISA Card, or send your personal check to order by mail. Mail Orders to: P. O. Box 1815-A, Santa Cruz, CA 95061-1815. Fax Orders to: (831) 763-7024.
- California residents add 7.25% sales tax (8.25% in Santa Clara County; 8% in Santa Cruz County; 8.5% in San Francisco).
- Shipping and handling charges additional. Call for rates. Delivery in U.S. and Canada only. Expedited delivery available.
- Prices are subject to correction or change without notice.

FREE 100-PAGE CATALOG
CALL (800) 447-1001

When ordering, mention key code TMA

2 GREAT LOCATIONS

Penna.-POCONO MOUNTAIN OPTICS

ORDERS: 800-569-4323
INFO: 570-842-1500

Las Vegas-POCONO WEST OPTICS

ORDERS: 800-635-3607
INFO: 702-252-7200

POCONO GLADLY ACCEPTS: *with no surcharge* DISCOVER NOVUS VISA MasterCard AMERICAN EXPRESS

$7.00 MINIMUM SHIPPING/ UPS (in U.S.)

- Purchase Orders from Qualified Institutions Gladly Accepted
- We Purchase and Take In Trade Used Telescopes

Visit Our Two Showrooms in Moscow, PA and Las Vegas NV!

We carry the following lines & products for all of your astronomical needs: See online or printed catalog for full details:

ACCESSORY CASES
ADIRONDACK VIDEO
APOGEE
APOGEE INSTRUMENTS
ASTROMETRICS-GO TO SYSTEMS
ASTRO SYSTEMS
12-VOLT BATTERIES
BRANDON
BUSHNELL
CELESTRON
COLLINS ELECTRO OPTICS
CORONADO H-ALPHA SYSTEMS
DESERT STORM COVERS
FUJINON BINOCULARS
HOMEYER FLIP MIRRORS
JMI
KENDRICK
LASER MAX
LOSMANDY
LOMO
LUMICON
MEADE
OPTEC
PARALLAX
PENTAX
QUESTAR
RIGEL SYSTEMS
SBIG
SOFTWARE BISQUE & SOFTWARE
TAKAHASHI
TECH 2000 DOB DRIVERS
TECTRON
TELE VUE
TELRAD
THOUSAND OAKS SOLAR FILTERS
UNIVERSITY OPTICS
POCONO SPECIALS & MORE

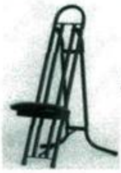
COMPUTER SOFTWARE

"THE SKY" by Software Bisque

CCD Soft	$219.00
Starry Night Deluxe	$89.95
Star Chart 3	$39.95

The Sky, Level 4 Version 5 Now Available.

Max DL Imaging Software	$365.00



OBSERVE IN COMFORT with STAR-BOUND VIEWING CHAIR

- Portable, Adjustable from 9" to 32"
- Padded Seat
- Porcelain Black Powder Coated Available in Black Only

Dealer Inquiries Invited **$159.00**

TELRAD w/Base $39.00

Batteries included!

Hinged Deluxe Dew Caps	$10.00
Extra Bases	$ 7.95
Extra Reticles	$ 2.95
Pulsar Unit	$19.95

RIGEL SYSTEMS

Starlite Dual LED Flashlight	$22.00
NEW Skylite: Dual Color LED Flashlight	$29.95
Quick Finder-New Version	*$35.00*

KENDRICK ASTRO INSTRUMENTS

Stay ahead of those soggy fall nights!

The Kendrick Dew Remover System for all size scopes, finders and mirrors

Keeps optics clear of dew, extending precious viewing time.

VISIT OUR 50+ PAGE ON LINE CATALOG WITH SECURED 24 HOUR ON LINE ORDERING AT: www.PoconoScopes.com

Look for our Monthly On-Line Specials! Call or write for our printed catalog & specials.

YOUR MEADE AUTHORIZED ADVANCED PRODUCTS MAIL ORDER DEALER

Meade Dobsonians: Available in: 6"F/8, 8"F/6,10" F/4.5, 12.5" F/4.8, 16" F/4.5, optional deluxe accessory package $49.95

New Meade ETX-90/EC and ETX-125/EC-with pushbutton electronic control comes standard *with dual-axis drive system* W/4 dual axis speeds. Add the Meade Autostar hand control to your scope and get fully automatic go to capability to over 12,000 objects. The ETX-125/EC has 5" of Aperture & RA Finder. Available Now.
ETX-90/EC $595.
ETX-125/EC $895.
Original ETX-90 RA $495.

ALL DS SCOPES AVAILABLE

Meade LX-200 SCT's, The World Famous "GoTo" Telescope Available in 8" F/10 or F/6.3, 10" F/10 or F/6.3, 12" F/10, 16" F/10.

ACCESSORIES FOR ETX-90 RA, EC, 125EC	
#126 Barlow	$47.95
#64 T-Adapter	$34.95
#932 Image Erect Diagonal	$49.95
Hard Case for 90	*$99.95*
Soft Case for 90 RA & EC	$39.00
07329 #775 Hard Case for ETX-125EC	$155.00
8X25 right Angle Finder for 90	$49.95
Auto Star Hand Control for 90 &125 EC	$149.00
Equatorial Table Top Tripod (w/Hi Lat Leg)	$29.95
Equatorial Table Top Tripod (w/Hi Lat Leg) for 125 EC	$55.00
Deluxe Field Tripod	$199.00
07077#1244 El. Focus for all ETX-90's	$119.95
07078 #1247 Elect. Focuser-ETX-125EC/S.scope	$119.95
DS SERIES ACCESSORIES	
07437 #495 Autostar (hand box only)	$99.
07438 #492 Dual Motor Elect. Control System	$129.
07439 #493 Autostar, Complete System	$199.
07076 #1240 Elect. Focuser	*$75.*
07041 #490 Elect. Focuser	$75.
07221 #937 2" Diagonal Mirror w/.96 & 1.25" Ad	$45.
Meade 8" LX-10	**$995.**
Super Wedge	$395.
New Field Derotator for 8", 10",and 12" SCT's, and 7" Maksutov	$395.

New ETX-60 $299.& New ETX-70 $349. Now Available

NEW 8" LX-90 SCT $1695.

World Renown Series 4000™ Eyepieces
Complete line in stock for immediate delivery!
NEW Meade Series 4000 8MM to 24MM Zoom Eyepiece $219.95

Tele Vue "WHEN YOU WANT THE FINEST"

We stock the entire Tele Vue line for immediate shipment. All items also on display and available for purchase and pick up at both of our showrooms.

NAGLERS 82° Apparent Field of View
Choose from 4.8 MM $175., 7 MM
9 MM $240.,16 MM $310
New Type 4
Orders
R
Av ... MM eye relief
... $228.00
PA ... parent Field of View
15MM ... MM $240., 22MM $280.,
27MM ... $330., 35MM (2") $365.

Pocono Announces its'
ANNUAL TELE VUE DAY
Saturday, October 21st, 10 A.M. to 5 P.M. at the Moscow, PA location.
Meet Al Nagler and the gang. Refreshments and product demonstrations.
Mark your calendar and be sure to attend!
New Product Demonstration???

MONTHLY SPECIAL

PRONTO w/2" DIAGONALPanoramic Mount and Quick Point Finder
POCONO MOUNTAIN OPTICS EXCLUSIVE

2.5x Powermate	$168.00
5x Powermate	$168.00
New 4x Powermate now avail.	$265.
New Bino Vue	*$1030.00*
8MM to 24MM ZOOM	$210.00
New Everbrite 2" Star Diag.	$255.00

***NEW* TV-102 In Stock $2050.**

Ranger, Pronto, TV-85 in stock

CELESTRON

We carry the full line of Celestron Telescopes and Accessories

NEW NEXSTAR 5 & 8

JUST ARRIVED! Flawless go-to and tracking. Superb optics, very quiet. A real winner! Nexstar 5 $1199. Nexstar 8 (w/tripod) New Low Price *$1699!*

CELESTAR 8 DELUXE

2032 MM FL., Heavy Duty Adj. Tripod Dec Motor and Hand Control. 4 Tracking Rates and PEC Fastar Compatable. In *Stock for Immediate* Shipment. $1699. Celestar 8, reg. version $1099.

ULTIMA 2000

Ultra Quiet Motors and Go To Impressive Pointing Accuracy. Runs off 8 AA Batteries. Enhanced Encoder Resolution. Fastar Compatable at F-2 for CCD use. 9X50 Finder. In Stock and Impressively Priced. $2699.

DESERT STORM COVERS

Protect your investment-
Covers available for all size scopes.
Manufactured with a thick mylar "heat resistant" material

4"- 6" Dobs & SCTs	$21.95
7" -8" Dobs & SCTs	$26.95
10" -13" Dobs & SCTs	$32.95
14" SCTs	$38.95
16" -18" Dobs	$44.95
20" -25" Dobs	$54.95

Dealer Inquiries Invited

ORDERING & SHOWROOM HOURS

Penna.-POCONO MOUNTAIN OPTICS
Order: 9-9 Mon.-Fri., 9-5 Sat., 12-5 Sun.
Showroom: 10-5 Mon.-Sat., 12-5 Sun.
Las Vegas-POCONO WEST OPTICS
Order: 9:30-6 Mon.-Fri., 10-5 Sat.
Showroom: 9:30-6 Mon.-Fri., 10-5 Sat.
Prices and specifications subject to change

Penna.-POCONO MOUNTAIN OPTICS
104 N P 502 Plaza, Moscow, PA 18444
FAX NO. 570-842-8364 Visit our Website at: www.PoconoScopes.com
E mail: pmo@PoconoScopes.com

Las Vegas-POCONO WEST OPTICS
2580 S. Decatur #3, Las Vegas, NV 89102
FAX NO. 702-252-7130 Visit our Website at: www.PoconoScopes.com
E mail: pwo@PoconoScopes.com

Mention Ad A-7

THERE IS NO SUBSTITUTE FOR APERTURE

Discovery Truss Designs and Premium DHQ Telescopes Deliver at the eyepiece, where it counts. Expert opticians and master craftsmen combine to produce large aperture telescopes that are unique in today's market. No other telescope combines aperture with the quality and value of Discovery's Truss Designs and Premium DHQ telescopes. All Discovery large aperture telescopes come with a **60 day money back guarantee**. Order yours today.

PREMIUM DHQ

- Baltic Birch base is lightweight and strong
- Your choice of Telrad® or 7x50 finderscope
- Exclusive, huge oversize, adjustable tube bearings
- Unequalled smoothness and stability
- Premium Pyrex® mirror set with enhanced aluminum coatings

12.5" f/5
62.5" (1587mm)
$999

14" f/4.5
75" (1905mm)
$1299

17.5" f/5
87.5" (2222mm)
$1899

TRUSS DESIGNS

- ApplePly construction
- Your choice of Telrad® or 7x50 finderscope
- EbonyStar®/Teflon® bearing surfaces
- 2" Crayford focuser
- Premium Pyrex® mirror set with enhanced aluminum coatings

12.5" f/5
62.5" (1587mm)
$1999

15" f/5
75" (1905mm)
$2499

17.5" f/5
87.5" (2222mm)
$2999

Discovery's complete line of Telescopes, Optics and Accessories

6",8" & 10"
Dobsonians

4.5", 6" & 8"
Equatorial Reflectors

EQ-RFT
Refractors

Custom Optics
to 24"

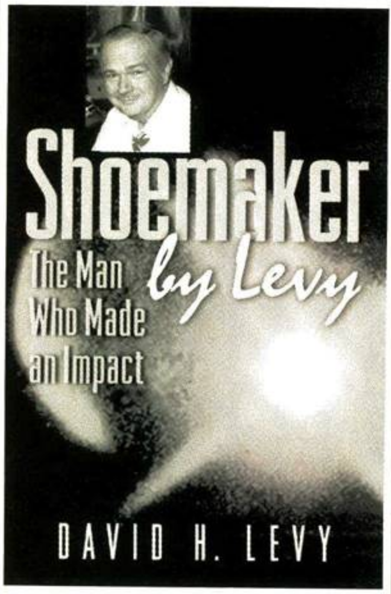
Accessories

Order toll free: (877) 523-4400
www.discovery-telescopes.com

DISCOVERY
TELESCOPES

615 South Tremont St.
Oceanside, CA 92054
(760) 967-6598 tel ▪ (760) 967-6798 fax

NEW FROM **PRINCETON**



Shoemaker by Levy
The Man Who Made an Impact
David H. Levy

The collision of the comet Shoemaker-Levy 9 with Jupiter was one of the most spectacular astronomical events of the twentieth century. This event revolutionized our understanding of the history of the solar system. As a close friend and colleague of Eugene Shoemaker, David Levy offers a uniquely insightful account of his life and work—and the way they have shaped our thinking about the universe.
Cloth $27.95

June 8, 2004— Venus in Transit
Eli Maor

"[A] charming guide. . . . Maor weaves his tale with clarity and historical precision."
—*Times Literary Supplement*

"This book will fascinate those interested in chasing rare astronomical events."—*Choice*
Cloth $22.95

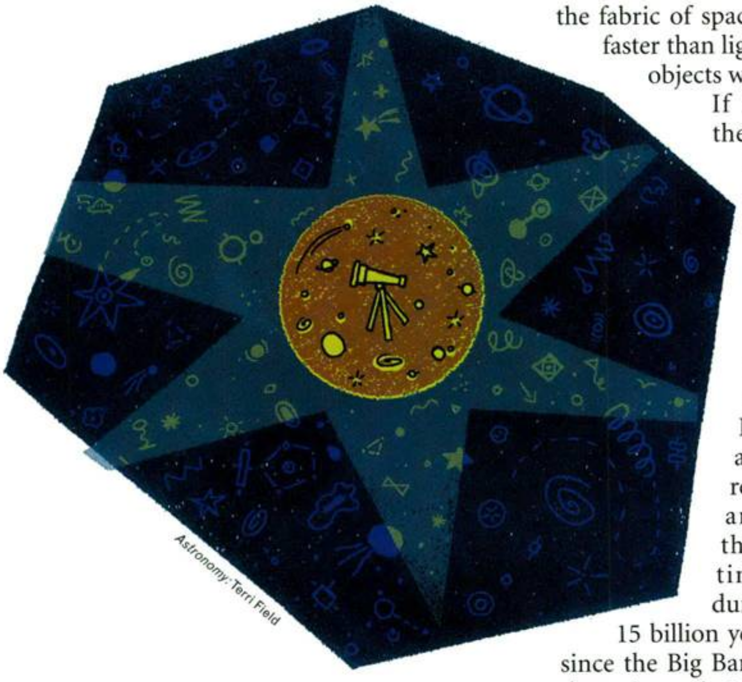
The Star of Bethlehem
An Astronomer's View
Mark Kidger

Was the Star of Bethlehem an actual astronomical event? Mark Kidger brings all the tools of modern science, years of historical research, and an infectious spirit of inquiry to bear on the mystery.
Cloth $22.95

Princeton University Press
WWW.PUP.PRINCETON.EDU

ask Astro

The Observable Universe, the Galactic Center, Asteroids


Astronomy: Terri Field

According to some cosmologists, the observable universe is just a tiny fraction of the whole universe. But if the first light in the universe came from the Big Bang, why can't we see the rest of the universe? — *Eberth J. Murillas, Cali, Columbia*

In a word, the answer is inflation. There is considerable evidence that the universe experienced a fleeting moment of hyperexpansion, called inflation, just after its birth (see "Unveiling the Flat Universe," August 2000). In a time period lasting only a tiny fraction of a second, the universe swelled in size by about ten thousand trillion trillion times.

That phenomenal expansion was much faster than the speed of light. The laws of physics permit such "superluminal" expansion because it is the fabric of spacetime that expanded faster than light, not the motion of objects within spacetime.

If inflation occurred, the universe is so large that even with telescopes such as Hubble and Keck, astronomers can only see a tiny part of it, just as a person standing on the ground can only see a tiny part of Earth's surface. Stars and galaxies in distant regions of the universe are so far away that their light hasn't had time to reach Earth during the 12 billion to 15 billion years that have elapsed since the Big Bang. In other words, if the universe is 14 billion years old, we can't see the light from a galaxy that is so far away that it takes its light more than 14 billion years to get here. — *Robert Naeye, Astronomical Society of the Pacific*

Why can't I look to the night sky and see the nucleus of our own galaxy? Other spiral galaxies show a brilliant center. — *Pedro Spearshaker, Lake Arrowhead, California*

Have no fear. A bright nucleus, located in the constellation Sagittarius, dominates the center of the Milky Way Galaxy too. The reason that we can't see it in visible light is a true astronomical case of not seeing the proverbial forest for the trees.

The Milky Way contains about 100 billion stars. But it's also full of gas and dust, collectively known as the interstellar medium. The gas and dust absorb and scatter starlight to create what astronomers call interstellar extinction.

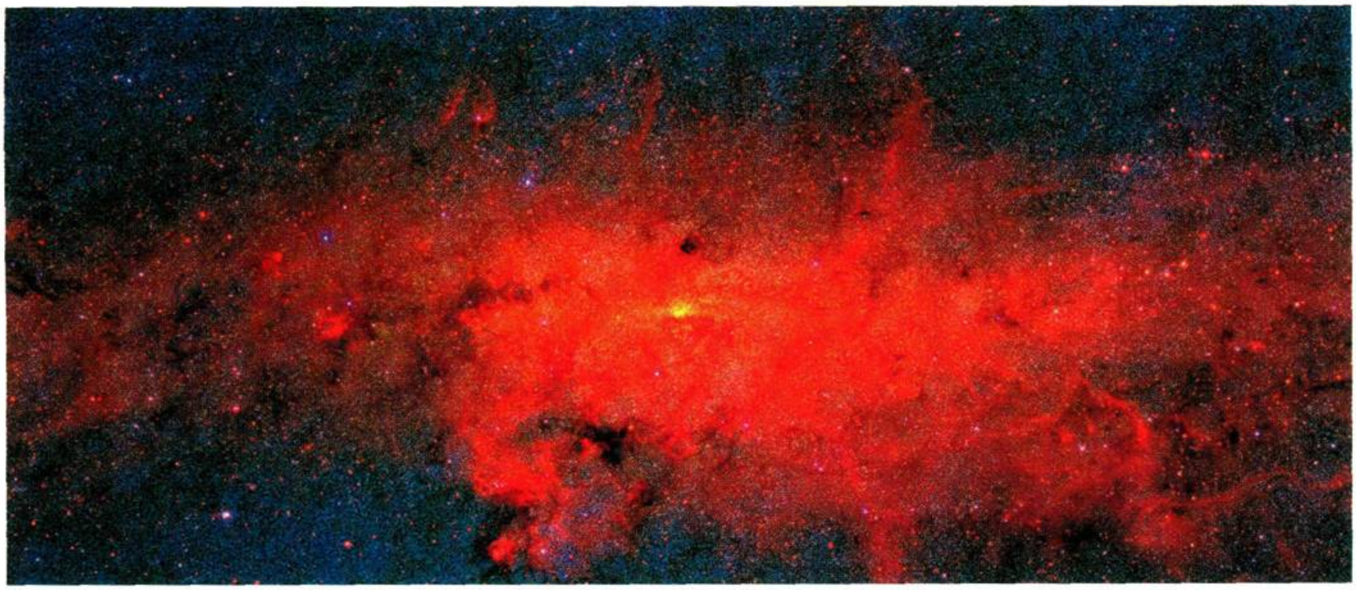
By sheer coincidence, visible light is disproportionately susceptible to interstellar extinction. Gas and dust particles strongly obscure light with wavelengths that are similar in size. The wavelength range of visible light just happens to overlap the size range of most interstellar particles.

With the sun lying in the thickest portion of the galactic plane, approximately two-thirds of the way from the center to the edge, visible light from the galactic center travels through thick clouds of gas and dust before reaching Earth. Consequently, about 90 percent of our galaxy, including the center, lies hidden. In fact, if there were no extinction of visible light by the interstellar medium, the galactic center would dominate the night sky with 100 times the brightness of Venus spread over an area 60 times the width of a full moon.

Anyone who has taken a good look at the Andromeda Galaxy (M31) through a telescope knows that professional and amateur astronomers can see the nuclei of other galaxies. That's because astronomers don't always have to look through a galaxy's thickest concentrations of gas and dust. Interstellar extinction becomes less of a problem for radio and infrared emission, which can penetrate obscuring gas and dust.
— *William Schomaker, associate editor*

An optical view of the galactic center, while brilliant, yields no view of the nucleus.

David Talent/AURA/NOAO/NSF



Infrared light is dimmed only slightly as it penetrates the dusty interstellar medium.

2MASS/Univ. of Massachusetts/Caltech/IPAC

I realize that the moon does not exactly follow the ecliptic in its orbit around Earth. But if it did, would Earth see a solar and a lunar eclipse every month? — *Everett Jennings, Geneva, New York*

The short answer is yes. If the moon orbited Earth in the same plane that Earth orbited the sun, skygazers could enjoy a lunar and solar eclipse every month. Unfortunately, the two orbital planes are tipped about 5° from each other, so lunar and solar eclipses occur infrequently.

But there's a catch. If the two orbits were in the same plane, total solar eclipses would be visible only from the tropics. Observers at temperate latitudes would never experience the awesome majesty of totality, but they could still enjoy partial solar eclipses like the one this December 25. And those near Earth's poles would never see a solar eclipse of any kind.

Because the moon's distance from Earth varies by about 12 percent, some of the solar eclipses would only be annular, meaning the sun's face wouldn't be totally obstructed. But because Earth's shadow is still big enough to cover the moon even when it's at apogee (its farthest point from Earth), all lunar eclipses would appear total from everywhere on the nightside of Earth.

The duration of total solar eclipses would remain the same, and the total eclipse path would still be very narrow. For this reason, the total reduction in solar illumination on Earth would be so minuscule that the increased rate of eclipses would have no discernible effect on Earth's climate. — *Richard Talcott, associate editor*

What size planet would have been formed if all the asteroids in the asteroid belt had coalesced? — *Bob Olson, Hemet, California*

If all the objects in the asteroid belt, from the largest asteroid, Ceres, all the way down to meter-size boulders, were accumulated into a single object, the resulting body would be just under 800 miles (1,300 km) across. That's only about one-third the diameter of Earth's moon.

The asteroid belt is a remnant of the material that once resided in the region between Mars and Jupiter. The main asteroid belt in the early solar nebula probably contained some 2 to 10 Earth masses of material, enough to make a substantial planet. Powerful winds from the newly forming sun, gravitational disturbances by massive Jupiter forming nearby, and the dynamical stirrings of other large planetesimals and protoplanets removed considerable material and prevented the formation of a single planet. Collisional grinding over the eons has removed additional mass from the asteroid belt.

To appreciate the true emptiness of the asteroid belt, imagine the following scale model: If we represent the sun by a typical 12-inch-wide globe, then Earth would be a BB orbiting 108 feet away. A mustard seed at 160 feet stands in for Mars, and Jupiter would be a ping pong ball 560 feet from the globe. Because all the asteroids combined would amount to a pile of rock about a third the size of our moon, we can picture the asteroid belt in this way: Pinch a large grain of sand into dust and scatter its remains as you walk in a circle around the globe 300 feet away.

Movie heroes in their spaceships may have to dodge swarms of asteroids on the silver screen, but they would have no trouble navigating through our asteroid belt. — *Dan Durda, Southwest Research Institute* A

CONTACT INFO

Send your questions via e-mail to: askastro@astronomy.com; or write to: Ask Astro, P.O. Box 1612, Waukesha, WI 53187. Please tell us your full name and where you live.

JMI's (www.jimsmobile.com)

NEW PRODUCTS SHOWCASE

"Monorail" **NEW** PAT. PENDING

JMI'S ANSWER to Plastic Focusers!

Replace plastic and other low-quality focusers with real quality. Our new revolutionary reverse Crayford focuser is so simply designed, it breaks the price barrier. It has all the same Crayford qualities–smooth focusing, zero image shift, stainless steel bearings, leveling screws and the coolest knobs–but at a fraction of the weight and price. It is now available in kit form. Assemble it yourself and save big.

The *Winner* of the *"Name the Focuser"* Contest is **Troels Holm** *from Denmark*

(Kit Focusers are only available through JMI. The price is reduced so low that there is no room for a Dealer margin.)

1 ¼"	Kit	$59.00 ($7)
2"	Kit	$79.00 ($7)
1 ¼"	Factory Assembled and tested	$79.00 ($7)
2"	Factory Assembled and tested	$99.00 ($7)

Breakthrough Design from JMI

"GO TO" SYSTEM FOR OBSESSION TELESCOPE

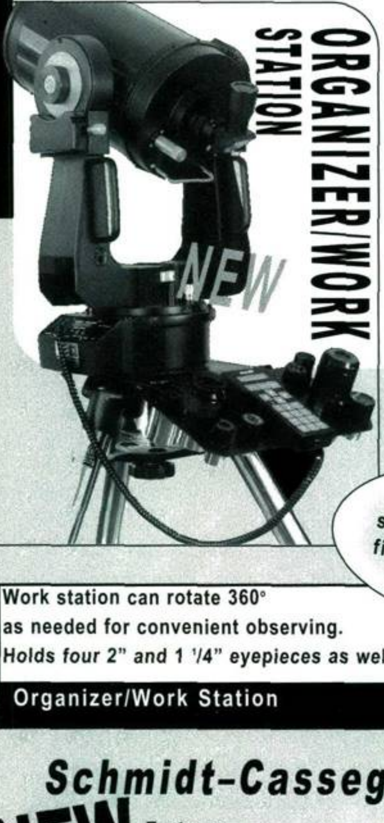
NEW

Finally, Alt/Az tracking with "GO TO" for your Obsession telescope. An easy two-star alignment prepares the computer for pointing the scope to any object in the database.

- 13,000 objects
- Compatible with TheSky software
- 0.1x to 1000x guiding and slewing speeds
- Complete with motors and a drive system developed by JMI
- Very easy to install
- Includes: Dual axis hand controller, RS-232 serial cable for connecting to a PC, 12v rechargeable battery with charger, AC adapter, bracket for hand held computer

Vixen SkySensor 2000-PC for Obsession telescopes $1695.00 ($20)

15" models are in stock now. Watch the web for up coming models.



ORGANIZER/WORK STATION **NEW**

Fits all Meade scopes with standard field tripod. (not 12")

Work station can rotate 360° as needed for convenient observing. Holds four 2" and 1 ¼" eyepieces as well as hand control.

Organizer/Work Station $99 ($11)

MEGAWEDGE!

Order now
1-800-247-0304
visa & mastercard accepted

NEW **$139** *($11)*

Holds 6 eyepieces

- It holds the ***ETX–90 Astro/EC–90, ETX–125, NexStar 5, NexStar 8.***
- Fits ***NexStar 5/8 tripod & Meade field tripod.***
- ***Now*** – with polar sight tube (folds away when not in use)
- Adjusts from zero to ninety latitude.
- Extremely easy to install with ***JMI's exclusive slide-on mounting.***

ALL NEW DESIGN

MOTOFOCUS **NEW**

FOR NEXSTAR 5" & 8" SCOPES

Easy to install, smooth operation clutch allows manual or smooth operation.

MOTOFOCUS for NEXSTAR 5" & 8" $119.95 ($6)

Manual version of *JMI's famous zero–image–shift NGF–S focuser*

Schmidt-Cassegrain Focuser

NEW ***Features:*** *Fits Meade and Celestron (SCT).*

- *Extra fine control, one rotation of the knob gives 0.39" travel.*
- *Low profile adds less than 2–½".*
- *Heavy duty, carries 8 lbs.*
- *Solid anodized aluminum.*
- *Focus lock.*
- *2" output plus threaded output adapter.*

All SCT accessories can be used.

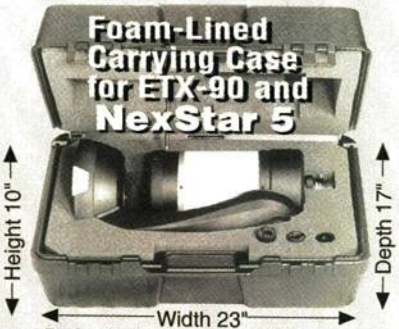
***NGF–SE Focuser $169** ($7)*

8:00am to 5:30pm M–TH
8am to 4pm F (Mountain Time Zone).
Prices subject to change without notice.

Jim's Mobile Inc. • 810 Quail St. Unit E • Lakewood, CO 80215 • Orders: 800-247-0304 • Info: 303-233-5353 • Fax: 303-233-5359

JMI ACCESSORIES SHOWCASE

WE DO NOT SELL ETX or NexStar SCOPES
ETX and Autostar are trademarks of
Meade Instruments Corp.



Foam-Lined Carrying Case for ETX-90 and NexStar 5

- Professional Die-Cut Foam Lining -Top & Bottom (No cubes to fall out).
- Compartments to hold eyepieces, hand controls, etc.

IMPORTANT:

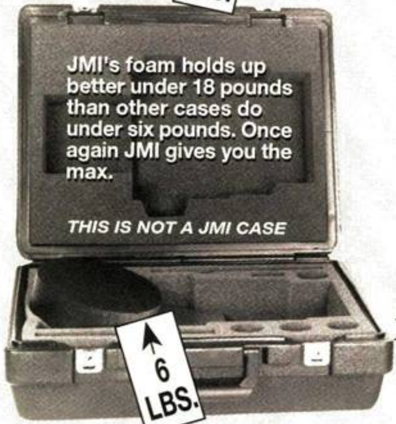
The ETX-90 and the NexStar 5 can easily fit in the overhead compartments of airlines. Explain to your airline that this is expensive, delicate equipment and you should have no problem with carry-on.

NexStar 5 $149.95 ($8)

CALL NOW TO ORDER
1-800-247-0304
Visa and MasterCard accepted.

ETX-90 and ETX-90EC
JMI cases have always used foam that is far superior to the other ETX cases . More rigid foam, more cubicles, more spacing between scope and accessories. Double wall shipping box.
ETX-90, ETX-90EC 109.95 ($7)

DEMAND A JMI CASE



JMI's foam holds up better under 18 pounds than other cases do under six pounds. Once again JMI gives you the max.

THIS IS NOT A JMI CASE

New Feature- All Megapods now include a polar alignment site tube at no extra cost!

SOLID AS A ROCK 16 GAGE STEEL LEGS- THICKER THAN THE FENDERS ON YOUR CAR

Piggy-Back Camera Mount	
For ETX-90, ETX-90EC	$59.95 ($6)
For ETX-125EC	$74.95($6)
For NexStar 5	$69.95 ($5)

NEW "MEGAPOD"

BREAKTHROUGH!! ILLUMINATED Tripod Legs!

SOLID STEEL

MADE IN U.S.A.

- Convenient storage for your eyepieces
- Convenient holder for your Autostar
- Adjustable legs with bubble level
- NO FUMBLING to get screws into blind holes
  Telescope slides into place

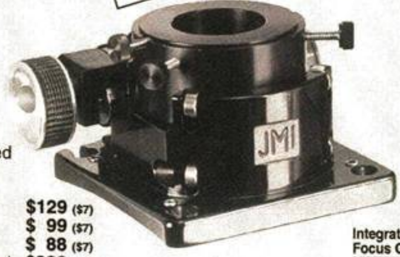
Folds to 31" Extends to 50"
Adjustable with latitude scale (0° to 90°).

That's right! The MEGAPOD has blinking red lights at the tips of the feet to prevent accidentally bumping the legs of your MEGAPOD. (The last thing you need is to do a computer star realignment because your telescope accidentally got bumped.) A toggle switch activates the lights.

MEGAPOD for ETX-90, ETX-90EC, ETX-125EC, NexStar 5 $229.00 ($14)

Zero Image Shift Focuser

"To put it bluntly, if there's a better line of commercial focusers made for imaging, I don't know about it." Dennis di Cicco 3/94 Sky & Telescope



Solid aluminum design for all popular scopes starting at $88. MOTOFOCUS upgrade for NGF Focusers $100. Must be ordered together.

NGF-DX1 2" with 1.25" adapter Lifts to 12 lb.	**$259 ($7)**
NGF-DX2 2" with 1.25" adapter Lifts to 10 lb.	**$199 ($7)**
NGF-DX3 2" with 1.25" adapter Lifts to 5 lb.	**$159 ($7)**
NGF-DX4 2" Lifts to 2.5 lb.	**$119 ($7)**
NGF-mini2 1.25"	**$129 ($7)**
NGF-mini3 1.25"	**$ 99 ($7)**
NGF-mini4 1.25"	**$ 88 ($7)**
DRO (digital focusing)	**$229 ($7)**
DFC	**$59.95 ($5)**
MOTOFOCUS when ordered with focuser	**$100 (N/A)**

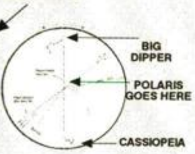
NGF-S for SCTs - This special version of our NGF focuser fits directly onto 2" thread of Meade and Celestron 8" - 14" Schmidt Cassegrain telescopes.

NGF-S w/ built-in MOTOFOCUS Includes 2" - 1.25" eyepiece and T-Thread adapter and 2" threaded output adapters.	**$269 ($7)**
Optional Large-Format Adapter for 10"+ SCTs	**$45 ($5)**
NGF-miniS 1.25" version (2" travel for SCTs)	**$229 ($7)**

CALL NOW TO ORDER
1-800-247-0304
Visa and MasterCard accepted.

EZAlign - Another Exciting Product from JMI

Rotates to Align Constellations
Integrated Digital Focus Counter & MOTOFOCUS
Our After-Market Computers fit over 100 Models of Telescopes



MOTODEC for most popular Telescopes as low as $89.95 ($6)

ALSO FOR SOUTHERN HEMISPHERE

- **Fits Fork Mounted Telescopes**
- **Easy to Install, No Drilling**
- **No Need to Remove for Transport**
- **Illuminated reticle included**

$220.00 ($6)

JMI'S NEWEST ETX PRODUCT:

INSTAFOCUS

ETX AUTOSTAR
MEADE
NO SURFING

NO SURFING FOR FOCUS MODE

The sensible alternative to scrolling through files every time you need to touch up focus or change eyepieces. Saves you lots of time. Does not plug into the Autostar. Motor plugs directly into hand control.
Motor, batteries and cord included.

InstaFocus for the 90EC	**$109.95 ($6)**
InstaFocus for the 125EC	**$109.95 ($6)**
Motofocus for 90 Astro	**$99.95 ($6)**
Motodec for 90 Astro	**$99.95 ($6)**

InstaFocus hand control snaps onto the Autostar

jimsmobile.com

"Wheeley Bars are the best kept secret in the industry."
Wayne P., Ohio

MEDIUM SIZE UNIVERSAL WHEELEY BARS

Move your scope with ease, level, lock the wheels, fits most Meade 2080/2120, Starfinder 6/8/10, most SCT's up to Ultima 11, adjustable tip-to-tip distance 31 to 41 inches.

TPWUMED $169.95 ($15)

LARGE SIZE UNIVERSAL WHEELEY BARS

For Meade Giant Field Tripod,
Meade LXD700/750 and Celestron CI-700

TPWULG $229.95 ($25)

BREAKTHROUGH Integrated Digital Focus Counter

with Heavy Duty MOTOFOCUS-Great for CCD work. 999 on display = 10 turns.

Fits all Meade and Celestron SCTs and MAKs, 7" through 14"

MOTOFOCUS with DFC $169.90 ($8)

Works with manufacturer's hand unit. Add $10 if you require JMI's hand control.

Now available for most JMI MOTOFOCUS Units. Add $59.95 ($5) to MOTOFOCUS price.

PUSH ON MotoFOCUS
Integrated Digital Focus Counter

8:00 AM to 5:30 PM Monday thru Thursday – 8 AM to 4 PM Fridays (Mountain Time Zone) – Prices subject to change without notice.

Jim's Mobile Inc. • 810 Quail St. Unit E • Lakewood, CO 80215 Orders: 800-247-0304 • Info: 303-233-5353 • FAX: 303-233-5359

LUMICON® High Performance

21 Years of Innovation!

WWW.LUMICON.COM

Visit our San Francisco Bay Area Showroom M-F 9-7, Sat 10-3

NexStar 8
CELESTRON

Two BIG items from the NexStar Family

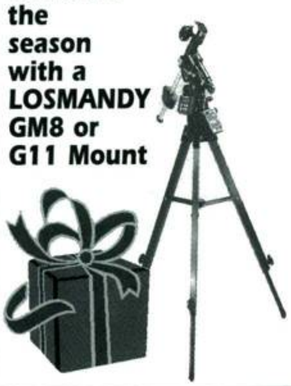
First: The price of the NexStar 8 has DROPPED to $1,699. Second: Celestron has added 3 new beginner sized telescopes to the NexStar family

NexStar 60 GT 60mm f/12 refractor w Go-To Mount	$299
NexStar 80 GT 80mm f/5 refractor w Go-To Mount	$399
NexStar 114 GT 114mm f/9 Newtonian w Go-To Mount	$499

Other Celestron Telescopes at Lumicon

NexStar 5	$1199
Ultima 2000	$2699
Celestar Deluxe	$1699
Celestar	$1099
CM 1100– 11" SCT	$3199
Starhopper 8" Dob	$429
Starhopper 6" Dob	$339
C102-HD 4" Refractor	$549
FirstScope 114	$299
CR150 6" f/8 Refractor (NEW)	$1299

Celebrate the season with a LOSMANDY GM8 or G11 Mount



The G8 & G11 Mounts are among the finest mounts made in America. Both have dual-axis drive with periodic error correction built in. The GM8 can carry 30 lbs. of equipment, the G11 can carry 60 lbs. of equipment.

GM8 Mount with Tripod	$1499
G11 MountwithTripod	$1899

Other fine Losmandy accessories available.

LUMICON FILTERS - BEST IN THE WORLD BUT WHICH FILTER TO BUY?

LUMICON H-BETA
LUMICON OIII
LUMICON UHC
LUMICON DEEP-SKY

Lumicon Deep Sky Filters follow the classic broad band curve but offer the highest transmission of nebula lines of any such filter available. Lumicon Deep Sky filters block mercury and sodium vapor lamp emissions while letting thru all other parts of the spectrum. Deep Sky Filters are most useful for astrophotography (color & b&w) and CCD work. Deep Sky Filters are also useful visually, nebula offering the best contrast gain but galaxies, star clusters and dusty comets are also slightly enhanced.

1.25" Deep Sky Filter (fits most 1.25" eyepieces)	$99.50
48mm Deep Sky Filter (fits 2" eyepieces and Lumicon accessories)	$199.50
Visual Back Deep Sky Filter (fits in series on back threads of SCT'S)	$199.50
2" Deep Sky Filter (fits 2" eyepieces and T-threaded accessories)	$199.50
72mm Deep Sky Filter (for the front of large telephoto lenses*)	$399.50

*step rings for other sizes available.

Lumicon Ultra High Contrast Filters have a narrow band pass that lets thru the two oxygen III and the hydrogen beta lines while blocking the remaining visual spectrum. The resulting filter yields high contrast views of all types of nebula. It is best used visually with any telescope of f/6 or longer focal ratio. The Ultra High Contrast Filter is not for photography.

1.25" Ultra High Contrast Filter (fits most 1.25" eyepieces)	$99.50
48mm Ultra High Contrast Filter (fits 2" eyepieces and Lumicon accessories)	$199.50
Visual Back Ultra High Contrast Filter (fits in series on back threads of SCT'S)	$199.50

Lumicon Oxygen III filters isolate just the two oxygen III lines of the spectrum and block the remaining visual spectrum. The Oxygen III filter yields the maximum contrast gain possible on planetary nebula and most emission nebula. Views of the Veil Nebula and others with this filter are beyond words. The Lumicon Oxygen III Filter is for visual use only and is best suited for 6" and larger aperture telescopes with focal ratio of f/10 or faster.

1.25" Oxygen III Filter (fits most 1.25" eyepieces)	$99.50
48mm Oxygen III Filter (fits 2" eyepieces and Lumicon accessories)	$199.50
Visual Back Oxygen III Filter (fits in series on back threads of SCT'S)	$199.50

Lumicon Hydrogen Beta Filters isolate just the hydrogen beta line of the spectrum and block the remaining visual spectrum. The Hydrogen Beta filter was created with a select number of low energy nebula in mind such as the Horsehead, Cocoon & the California nebula. In many instances the Hydrogen Beta filter is the **ONLY** way to see these nebula. The Hydrogen Beta Filter is a visual filter only, best suited to 8" or larger aperture telescopes with focal ratios of f/5 or faster.

1.25" Hydrogen Beta Filter (fits most 1.25" eyepieces)	$99.50
48mm Hydrogen Beta Filter (fits 2" eyepieces and Lumicon accessories)	$199.50
Visual Back Hydrogen Beta Filter (fits in series on back threads of SCT'S)	$199.50

Special Pricing – Buy two or more Lumicon filters and get a DISCOUNT.

Filters normally priced at $99.50	pay only $92.50
Filters normally priced at $199.50	pay only $185.00

SKY VECTOR™ $349!!!

Includes Computer, Encoders, Hardware

LUMICON Sky Vector Features:

- "GUIDE" mode leads you to object
- Digital right ascension readout to 1 min.
- Digital declination reading to 10 arc/min.
- 4000 pulse (0.09 accuracy) encoders
- Polar Alignment NOT REQUIRED!
- Motor drive NOT REQUIRED!
- Just two stars to align
- Works Equally well for alt-azimuth telescopes like Coulter Odyssey and equatorial mounts like C-8, Meade 2080.
- No need to enter latitude, longitude etc.

SKY VECTOR I™ $349.00

NEW! With over 220 object memory including the 110 Messier and 58 best NGC objects.

SKY VECTOR II™ $399.00

Over 3600 objects! Also included planets and full visual descriptions.

NGC-SKY VECTOR™ $489.00

12,000 objects! PC serial port NGC Sky Vector with IDENTIFY (Sky Tour) mode; 12,000 object memory including the corrected RNGC catalogue, IC catalogue, P&K planetary catalogue and much more.

NGC-Sky Vector
OFF ON
DIM
MODE
ENTER
UP
DOWN
LUMICON

Specify Telescope Type: Meade 4",8", 10",12" SCT, C-8, C-11, Odyssey 8", 10", 12", 17$^{1/2}$" alt-azimuth; Meade 6"-16" Dobsonian. Ultima 8", 9 $^{1/4}$", 11" add $25. C-14 add $75.

TELE VUE PRODUCTS

4X Powermate for 2" eyepieces	$265
5X Powermate boosts magnification 5x	$168
Ranger 70mm f6.8 apchromat w/1$^{1/4}$" diag.	$695
Pronto 70mm f6.8 w/1$^{1/4}$" diagonal.	$945
Tele Vue 85, 85mm f/7 APO telescope	$1995
Bino Vue binocular w/2x correc.	$1030
Gibraltar mount with ash wood tripod	$530
8,11,15mm Plossl . $82 — **20,25mm**	$95
32mm Plossl, widest true field in 1$^{1/4}$"	$110
55mm Plossl, widest possible field	$230
2.0x or 3.0x Tele Vue Barlow Lens	$105
2" Giant Barlow – 2x	$168
4.8mm Nagler 82° field, 1$^{1/4}$" eyepiece	$175
7mm Nagler, 1$^{1/4}$" eyepiece, 82° field	$220
9mm Nagler, 82° field 1$^{1/4}$" or 2"	$240
12mm Nagler Type 4, 82° 1$^{1/4}$" or 2"	$340
16mm Nagler Type II, 82° 1$^{1/4}$" or 2"	$310
17mm Nagler Type 4, 82° 2" only	$370
22mm Nagler Type 4, 82° 2" only	$445
31mm Nagler Type 5, 82° 2" only	$595
2" Paracorr visual coma corrector	$235
3,4,6,8,10,14mm Radian, 60° field	$228
15mm Panoptic 1$^{1/4}$", 68° field	$210
19mm Panoptic 1$^{1/4}$", 68° field	$240
22mm Panoptic 1$^{1/4}$"/2", 68° field	$280
27mm Panoptic 2", 68° field	$330
35mm Panoptic 2", 68° field	$365
NEW! Tele Vue 18mm radian, 60° field	$228.

Note: Tele Vue warranty may not be valid outside USA

Tele Vue's Newest!

Lumicon, always in the forefront bringing you the latest scopes and specials, brings you the newest scope from Tele Vue. The Tele Vue 102 (shown with optional Gibralter Mount) brings you the best of apochromatic optics in a longer 880mm f/8.6 length making it and even better choice for planetary viewing than previous releases.

Tele Vue 102 tube assembly only	$2050
Tele Vue tube holder for 102	$120
Tele Vue Ash Gibralter Mount	$530
Lumicon 2" Enhanced Aluminum Star Diagonal	$189.50
Lumicon 2"/1.25" Reducer	$25

We are Takahashi dealers
Call for lowest prices!

LUMICON

6242 Preston Avenue, Livermore, CA 94550

Phone Orders: Call our toll free ORDER LINE: 1-800-767-9576
EXPERT Information and Catalog Requests: Call 1-925-447-9570
FAX 1-925-447-9589 ▪ Prices subject to change without notice
In stock items shipped within 2 business days

LUMICON®

6242 Preston Avenue
Livermore CA 94550

Phone hours: M-F 9AM/7PM pst
Sat. 10AM/3PM pst 1-925-447-9570

Telescopes and Accessories

ORDER TOLL FREE
1-800-767-9576

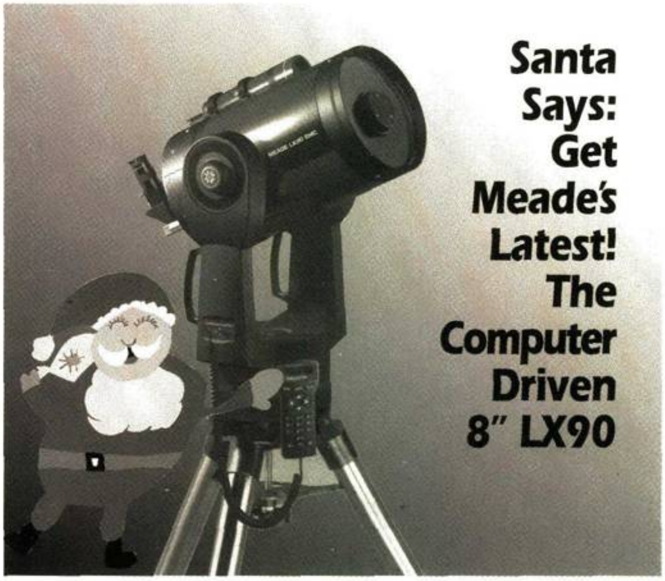
LUMICON Now Bigger, More Modern Than Ever

Anyone from San Francisco to Reno, Redding to Bakersfield is invited to visit our new, spacious facilities at 6242 Preston Avenue in Livermore, CA!

Lumicon has doubled its size and tripled its showroom space – providing a huge selection of Telescopes, Binoculars, Spotting Scopes and related optical accessories right on the floor. . . .And our inventory is growing all the time.

Even our hours are "bigger"
The showroom is now open until 7 p.m. weekdays
and 3 p.m. on Saturdays

Give us a call for directions. We're just two blocks off US 580



Santa Says: Get Meade's Latest! The Computer Driven 8" LX90

PENTAX EYEPIECES

Great Prices! Pentax 65°XL

Amazing performance! All have 20mm eye relief, adjustable helical eye guard, super multi-coatings, E.D. Glass

5.2mmF.L., 65°Apparent Field 1¼"	$279
7mm F.L., 65° Apparent Field 1¼"	$279
10.5mmF.L., 65°Apparent Field 1¼"	$269
14mm F.L., 65° Apparent Field 1¼"	$269
21mmF.L., 65°Apparent Field 1¼"	$269
28mm F.L., 55° Apparent Field 1¼"	$259
40mmF.L., 65°Apparent Field 2"	$299

Pentax Binoculars Spectacular 20mm eye relief

5x40mm Pentax PCFV Binocular	$169
7x50mm Pentax PCFV Binocular	$169
10x50mm Pentax PCFV Binocular	$184
16x60mm Pentax PCFV Binocular	$249

THE SCOPE REVOLUTION CONTINUES

Meade engineers have come out with their latest entry in the computer driven telescope revolution. The 8" LX90 combines Meade's proven optics with a dual metal fork arm mount and Autostar technology to produce a low priced, fully capable alternative. Both axis have a 4.9" worm drive for smooth motion. The 8" LX90 comes with the same tripod as the LX200. **All for a low $1695** (plus $95 shipping)

Other Fine Meade Telescopes at Lumicon

8"LX200 SCT with Tripod ($105p/s)	$2295
10"LX200 SCT with Tripod ($145p/s)	$2695
12"LX200 SCT with Tripod ($215p/s)	$3995
Wedge for 8" LX200(for photography) ($15p/s)	$139
Superwedge for 10"/12"LX200($35p/s)	$395
8" LXD500w/German eq. mt ($65 p/s)	$895
8"LX10 SCT w/RA drive ($65 p/s)	$995
ETX 90EC Maksutov w/std.drives ($20p/s)	$595
ETX125EC Maksutov w/std.drives ($30p/s)	$895
DS80 EC w/dual drives ($45p/s)	$449
DS90 EC w/dual drives ($50 p/s)	$499
DS114EC w/dual drives ($45 p/s)	$399
DS127ED w/dual drives ($50 p/s)	$499

Meade Starfinders 6 -16"

6"f/8 Dobsonian Starfinder ($46P&S)	$249
6"f/8 Equatorial Starfinder ($79 P&S)	$499
8"f/6 Dobsonian Starfinder ($59P&S)	$349
8"f/6 Equatorial Starfinder ($89 P&S)	$599
10"f/4.5 Dobsonian Starfinder ($85 P&S)	$449
10"f/4.5 Equatorial Starfinder ($99 P&S)	$699
12.5"f/4.8 Dobsonian Starfinder ($95 P&S)	$795
16"f/4.5 Dobsonian Starfinder (frt. COD)	$1195
16"f/4.5 Equatorial Starfinder (frt. COD)	$2695

*All Starfinder telescopes shipped directly from Meade to the purchaser. Please add the indicated packing and shipping charge to the price. Slightly lower P&S for payment by check. Lumicon showroom prices are $50 to $100 higher.

See the Meade ad in this magazine for full descriptions. Starfinders are complete telescope systems with motor drive and finderscope (Equatorial only) and 25mm (48x) eyepiece. New DC motor runs on four AA batteries.

Happy Holidays from all of us at Lumicon Have a bright, clear Christmas with these HOLIDAY SPECIALS

Lumicon Cassegrain Easy Guider for 5" thru 9.25" SCT's: $219 (save $30). Simply the best off-axis guider on the market. Specify which telescope and camera you will be using.

Lumicon 80mm Straight-Thru Super Finder w/ NEW 10X Plossl Cross-Hair Eyepiece: $199 (Save $40). Lumicon 80mm Super Finder with 90 Degree Erect Image Prism and 10X Plossl Cross-Hair Eyepiece: $239 (save $40).

Purchase all four Lumicon filters at regular price of $398 and receive a Lumicon 5x Filter Selector (A $99.50 value) absolutely free!

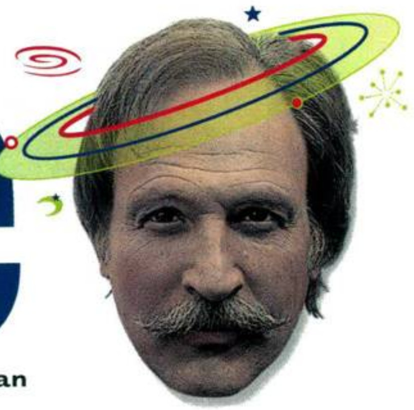
Lumicon 1.25" Enhanced Aluminum Star Diagonal: $89 (save $10). Lumicon 2" Enhanced Aluminum Star Diagonal: $169 (save $20). Improves clarity and brightness on most SCT and Refractor Telescopes

Special Holiday Prices in effect Nov. 1 thru Dec. 23, 2000

Meade & Celestron

Lumicon carries a full line of
Meade & Celestron Telescopes & Accessories
All at competitive prices & with FAST delivery
California residents add 8.25% sales tax

strange Universe



by Bob Berman

Cosmic Gratitude

Most of us have a lot to be thankful for. It would be nice (novel, anyway) to hold a Thanksgiving star party, where astronomers could rattle off their own special reasons to be grateful. I'll go first.

For starters, I'm grateful that nobody is actually going to do this. In most of the United States an outdoor late-November dinner would be "cold turkey" under freezing, eerie, barren branches. So instead of a freezing spooky dinner as a forum for expressing appreciation, I'm merely compiling a simple list of "things astronomers can be grateful for."

I'm thankful that at star parties, nobody plays music through the loudspeakers. Granted, background ambience might be pleasant. (Lots of people think that Bach, say, would be appropriate while gazing at nebulae, and our culture already regards silence with suspicion. We have music nearly everywhere else: Elevators, malls, telephone "holds." Even at planetaria while people file in.) As an observatory director, I'll admit to being tempted, on public viewing nights, to play some atmospheric music. Problem, of course, is different tastes. I think listening to rap music should be a misdemeanor, but you may think Saturn looks better accompanied by hip-hop. Of course, an observing session is not silent. There's the muttering and periodic yelps that accompany dropped eyepieces and CCD holders, and here's where we get back to being thankful.

You know how there's a long pause between the time you stub your toe and the moment you feel the pain? There ought to be a name for that interval, those couple of seconds designed sadistically by nature when your logic center hangs in terror awaiting the verdict about how much it's gonna hurt. That pause routinely comes into play while under the stars, since our pastime seems specifically blueprinted for injury. It's dark, equipment is lying around, you're toting heavy things such as counterweights. Of course, your foot is going to get slammed. Well, here's where I'm grateful.

The last time I dropped a counterweight on my toe and waited the required three seconds for the verdict: Nothing happened. Maybe after a certain number of repetitions, nerves lose their sensitivity and you develop "astronomer's toe." Like calluses acquired by guitarists, it becomes an occupational benefit, as the astronomer's body compensates for various cosmic abuses.

Similarly, the one-eyed squint so familiar to pirates and telescope owners eventually evolves. You actually get accustomed to keeping both lids open while attending solely to the picture from just one eye. The image seen by the other (usually a neighbor's growling dog pulling on your pants leg) is totally disregarded.

We can be grateful for other ways we adapt to astronomy. By keeping his yard light on while you are trying to observe a faint galaxy, your neighbor deserves to serve an indefinite term at a special brightly lit prison. Dealing with such people gives astronomers an exceptionally high tolerance for lesser crimes and frailties. No longer will you roll your eyes the next time someone says, "You're an astronomer? What's your sign?" No longer do you get perturbed when taxed to build spacecraft designed to explode upon reaching Mars.

No, life becomes smoother once you're a backyard astronomer, and for this I'm grateful.

I'm grateful that the moon and sun both appear the same size which allows total eclipses to occur in our lifetimes. In just a few tens of thousands of years, the slowly spiraling-away moon will still be 400 times smaller than the sun, but no longer will it also be 400 times nearer.

I'm grateful that we live in a spiral arm and not the center of our galaxy — which would make it much harder, maybe impossible, to survey the rest of the universe because it would be blocked by dust. Similarly, I'm glad that we do not live in the center of a globular cluster, for a different reason. There, it wouldn't be dust that hides the cosmos, but excessive brightness.

I'm grateful water is different from all other molecules of its size and weight and acts as if it were much heavier. This alone allows H_2O to be liquid at the relatively high temperatures found in our dining rooms, and lets our veins and brains be filled with fluid instead of gas.

I'm especially grateful astronauts do not make political speeches every time they land.

I'm grateful Earth doesn't orbit Betelgeuse. Not just because that name means "Sheep's Armpit," but because it's likely to explode before too long, which would make everyone neurotic.

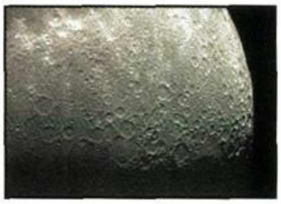
I'm grateful that good telescopes are affordable.

And I'm also glad that during the earliest UFO landings, some of the aliens got left behind and multiplied here on Earth, where they came to be enjoyed . . . as turkeys.

SBIG
ASTRONOMICAL
INSTRUMENTS

ANNOUNCES THE REVOLUTIONARY
STV

SBIG ASTRONOMICAL INSTRUMENTS
STV
Show Test Ptrn.
Next
Focus
Image
Monitor
Acquire
Parameter
Value
Control
Calibrate
Track
Guide
Display/ Crosshairs
File Ops
Process
Setup
Interrupt



The First STAND ALONE DIGITAL INTEGRATING
VIDEO CAMERA AND AUTOGUIDER

LIKE NO OTHER ASTRO CAMERA OR AUTOGUIDER IN THE WORLD

- EASY TO USE, PORTABLE - **NO COMPUTER REQUIRED**
- VIEW THE MOON, PLANETS **AND** DEEP SPACE OBJECTS ON ANY VIDEO MONITOR OR ON THE OPTIONAL BUILT-IN 5″ LCD DISPLAY
- RECORD VIDEO IMAGES ON ANY VCR
- NO FRAME GRABBER REQUIRED
- STORE DIGITAL IMAGES IN THE STV's INTERNAL MEMORY FOR DIRECT DOWNLOAD TO A COMPUTER AT A LATER TIME
- OPERATES AS A STAND ALONE AUTOGUIDER, 30 TIMES AS SENSITIVE AS A ST-4
- REACH 14th MAGNITUDE IN ONE SECOND (18th MAGNITUDE IN ONE MINUTE) THROUGH AN 8″ SCOPE

SBIG
ASTRONOMICAL
INSTRUMENTS

SANTA BARBARA INSTRUMENT GROUP
147-A Castilian Drive
Santa Barbara, CA 93117
Phone (805) 571-7244 FAX (805) 571-1147
e-mail: sbig@sbig.com Home address: www.sbig.com

BBB MEMBER METROPOLITAN NEW YORK

ADORAMA INC.

42 WEST 18th STREET • NEW YORK, NY 10011

12

PHONE ORDERS ACCEPTED DAY OR NIGHT
• Mon–Thurs. 9 till 9:30 PM
• Fri. 9-1:45
• Sunday 9:30–6 EST

STORE HOURS:
• Mon.–Thurs. 9–6:30pm
• Fri to 1:30 • SUN 9:30–5:30

web:
www.adorama.com

ORDER TOLL FREE • US & CANADA
800-7-ADORAMA
8 0 0 - 7 2 3 - 6 7 2 6

ORDERS & INFO	FAX
212-647-9800	**212-675-8715**

CUSTOMER RELATIONS • 800-815-0702
• Mon–Thur. 9–4:30, EST
E-mail: info@adorama.com

CELESTRON®
SCHMIDT CASSEGRAIN

ULTIMA 2000	**2699.95**
Celestar 8	**1099.00**
Hand Control f/Celestar	**54.95**
Celestar 8 Deluxe	**1699.95**
G-8 German Eq. 8"	**999.95**

New Celestron Nexstar

Nexstar 5	**1199.95**
Nexstar 8 W/Tripod	**1699.95**

Celestron Reducer/ Corrector f/6.3

Works with all Current Celestron and Meade Schmidt Cassegrains. Now it is possible to have a dual focal ratio instrument without sacrificing image quality. The Reducer/Corrector is f/6.3 *for C8 and C11*, f/7 for C14. A four element, fully multi-coated accessory. Results are amazing BOTH visually and photographically.

104.95

ACCESSORIES for NEXSTAR 5"
JMI

Motofocus	**89.95**
Megapod Tripod w/Wedge	**214.95**
Carry Case	**134.95**
Celestron Tripod	**174.95**
Celestron Case	**149.95**

CELESTRON TELESCOPE ACCS.

AC Adpt. C5+, C8+ Ultima	**18.95**
Car Bat. Adpt. C5+,C8+ Ultima	**19.95**
2X Barlow 1.25" Short Tube	**39.95**
Counterweight Bar Assembly 8"	**84.95**
Case for C8/C5	**179.95**
Piggyback Mt 8"	**34.95**
Piggyback Bar Assembly 11"	**69.95**
New Folding Lens Shades	**Call**

MOTORS

JMI DEC Motor C8+/Classic 8	**74.95**
JMI Motofocus f/Celestar 8, Nexstar 8	**84.95**
Celestron Focus Motor	**109.95**
Logic Drive f/CG3	**29.95**
S/A Drive w/Hand Cntrl f/CG-3	**79.95**
Single Axis Motor for CG-5	**114.95**
Dual Axis Drive for CG-4	**159.95**
Dual Axis Drive for CG-5	**169.95**

ADVANCED ASTRO MASTER

Advanced Astro Master for C8 11, & G5 Mount	**474.95**

FILTERS

LPR A	**59.95**
LPR B	**84.95**
Pol. Set 1¼"	**44.95**
Sky Filter #2	**44.95**
4 piece 1.25" FilterSet	**49.95**

DIAGONALS

Diagonal Erect 1.25" 45°	**39.95**
Diagonal Erect 1.25" 90°	**49.95**
Star Diagonal 1.25" 90°	**34.95**
2" Mirror Star Diagonal	**124.95**

FINDERSCOPES

9x50 Finderscope Kit	**79.95**
6x30 Finderscope Kit	**34.95**
7x50 Polaris Finder Scope with Illuminator & Bracket	**159.95**
Quick Release f/7x50 find	**42.95**
Star Pointer Finderscope	**24.95**
Polar Axis Finder f/CG-4/5	**44.95**

1.25" RACK & PINION FOCUSERS

1.25" Focuser	**29.95**

GUIDING SYSTEM

Radial Guider	**84.95**
Micro Guide Eyepiece	**139.95**
10mm Plossl Reticle	**84.95**
20mm Cross Hair Eyepce.	**34.95**
Standard Illuminator	**39.95**

TRIPODS & MOUNTS

Adj. Tripod Heavy Duty	**264.95**
CG-3 Equatorial Mnt.	**149.95**
CG-5 Equatorial Mnt.	**399.95**
Photo Tripod	**99.95**
Vibration Suppression Pads	**39.95**

NIGHT VISION ASTROLIGHTS

Night Vision LED Light	**14.95**

T-ADAPTER/TELE EXTENDERS

Tele Extender Deluxe	**48.95**
T-Adapt. f/Schmidt Cassegrains	**24.95**
T-Adapter/Barlow Lens 1.25"	**39.95**
T-C 16mm Adapter	**29.95**

ULTIMA EYEPIECES

5mm, 1¼"	**67.95**
18mm 1¼"	**67.95**
35m 1¼"	**96.95**
7.5, 1¼"	**67.95**
30mm, 1¼"	**84.95**
2X Ultima Barlow Lens	**62.95**
12.5mm, 1¼"	**67.95**
42m, 1¼"	**89.95**

PLOSSL EYEPIECES

7.5, 17mm, 1¼"	**31.95**

NEW NEXSTAR PLOSSL EYEPIECES 1.25"

3.6,6,8,10,13,17,25mm	**39.95**
32, 40mm,	**49.95**

NEW AXIOM EYEPIECES

15mm 1¼"	**129.95**
19mm 2"	**169.95**
50mm 2"	**274.95**
19mm 1¼"	**139.95**
34mm 2"	**209.95**
23mm, 1¼"	**149.95**
40mm, 2"	**249.95**

Vixen Lanthanum Eyepieces LV Series

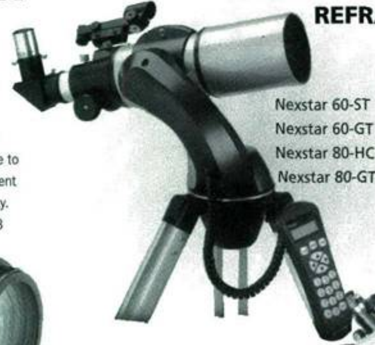
2.5mm,	**99.95**
4mm	**94.95**
6mm	**94.95**
12mm	**109.95**
5mm	**94.95**
9mm	**94.95**
15mm	**94.95**
10mm	**94.95**
8-24mm Zoom	**159.95**

Pentax XL SMC Eyepieces

5.2, 7, 10.5, 14, 21, 28mm, 1.25"	**219.95**
40mm, 2"	**239.95**

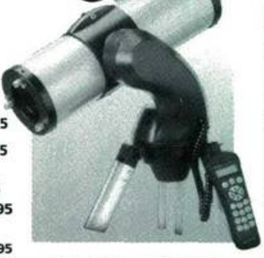
CELESTRON

NEW NEXSTAR REFRACTORS



Nexstar 60-ST	**189.95**
Nexstar 60-GT	**299.95**
Nexstar 80-HC	**299.95**
Nexstar 80-GT	**399.95**

NEW NEXSTAR REFLECTORS



Nexstar 114 HC	**399.95**
Nexstar 114 GT	**499.95**

REFLECTORS

8" Reflector	**699.95**
C-150 Heavy Duty 6" Reflector	**499.95**
C-114 HD	**299.95**
Firstscope 114 Deluxe	**189.95**
Firstscope 114 Premium	**209.95**

STAR HOPPER Dobsonian

4.5"	**219.95**
6"	**299.95**
8"	**389.95**
6x30 LER Finderscope	**39.95**

REFRACTORS

C-150 6" *Equatorial Reflector,*	**799.95**
C102 HD Altazimuth	**339.95**
C80 Heavy Duty	**349.95**
Firstscope 80 EQ.#21070	**224.95**
Firstscope 80 W.A. Equat.	**219.**
Firstscope 60 Alt. Deluxe	**79.95**
Firstscope 60 Equatorial with Aluminum Tripod	**114.95**

SPOTTING SCOPES

C90 MC w/1.25" Eyepiece	**Call**
Ultima 65	**129.95**
Ultima 80	**209.95**
15-60X Zoom	**144.95**
80mm Wide Field with 2 Plossl Eyepieces	**Call**
New 102mm Wide	**Call**

COMPACT G3 3.5" & G5 5" SCHMIDT CASSEGRAINS

with Equatorial Mounts

G-3 3.5" w/Motor Drive

$329.95

G-5 5" $699.95

Free 10mm Eyepicec w/ *purchase of G3/G5* Telescopes

Tele Vue®

WE STOCK THE COMPLETE LINE

of Tele Vue Plossls, panoptics, Naglers, Radians, Barlows & Powermates

TELE VUE REFRACTORS

PRONTO
70mm Aperture
f/6.4 with ED Glass
925.00

101mm and 85mm REFRACTORS

101mm	**2760.00**
85mm	**1995.00**

SKYGAZER SERIES TELESCOPES

80mm Equatorial

SPECIAL OFFER
80mm Refractor *includes a* FREE Single Axis Drive

910mm focal length (f/11.4) German Equatorial Mount, slow motion controls, setting circles, 25mm 1.25" eyepiece (36X), 1.25" *diagonal*, 6x30 finderscope, adjustable wood tripod only **224.95**

SKYGAZER 60 EQUATORIAL

900mm f/15 Refractor, **Two 1.25" Eyepieces,** German Equatorial Mount, Slow Motion Cables, Setting Circles in both axes, 6x24, Finderscope, Hybrid 1.25" Diagonal, Adjustable Tripod ....only **139.95**

SKYGAZER 114
(4.5)

SPECIAL OFFER
includes a FREE Single Axis Drive

Equatorial Deluxe Reflector Telescope

$189.95

114mm diameter Reflector with German Equatorial Mount, Slow Motion Controls in R.A. and DEC., 5x24 Viewfinder, Two 1.25" 25mm (36X) & 10mm (91X) Eyepieces, Adjustable Wood Tripod with Accessory Tray

STEREO BINOCULAR VIEWER $479.95

BUSHNELL

60mm Zoom Voyager Refractor	**79.95**
60mm Zoom Voyager Refractor with Rotary Eyepiece	**89.95**

Bushnell Compact 4.5" Reflector *$154.95*

Features a unique cradle mount which is convenient to use and transport. A wide field of view makes it easy to locate objects and keep them in view
- Aperture: 4.5" • Focal Length: 400mm
- Eyepieces: 1.25" 4mm (100X), and 25mm (16x)
- Focuser: Precision Rack & Pinion,

Tripod adaptable, includes convenient shoulder strap

TELESCOPE ACCESSORIES

DEW SHIELD

Collapsible, fold down, easy to store and transport

for Celestron C90	**18.95**
f/8" Schmidt Cassegrains	**28.95**
f/5" Scopes	**24.95**
f/10" Schmidt Cassegrains	**38.95**
f/11" Scopes	**49.95**

LUMICON FILTERS

BUY ANY 2 FILTERS AND TAKE 7% OFF THESE PRICES

UHC Premium, Deep Sky Premium, H-Beta or Oxygen III

1¼"	**99.50**
48mm	**199.95**
2" T Mount	**199.95**

TELRAD FINDER

TELRAD with Base	**36.95**
Dew Shield for Telrad	**11.95**
Spare Mounting Base	**7.95**

EASY TESTER

Optical Evaluation Eyepiece	**29.95**

JMI FOCUSERS

NGF-DX1	**249.00**
NGF-DX2	**185.00**
NGF-S w/Motofocus	**249.00**
NGF-DX3	**149.00**

SOLAR FILTERS GLASS

for Celestron C90/G3 & Meade ETX	**59.95**
for Televue Genesis/101	**59.95**
for Pronto/Ranger Televue	**49.95**
for Celestron 5"	**69.95**
for Schmidt Cassegrains 8"	**89.95**
for Meade 10"	**109.95**

WE SHIP PROMPTLY. ALL TELESCOPES INCLUDE U.S.A. WARRANTY

No Surcharge for MasterCharge or Visa Purchases. *Personal checks welcome, will ship without delay. Name must be imprinted on check, also include address, phone, and a* copy of major credit card or driver's license for reference. Shipping, handling and insurance additional. 14 day money back guarantee less shipping, with packing and blank warranty card, except film and paper. We ship UPS. Some items special order. All orders are subject to acceptance and verification. Second hand dealer's license #802862. Pictures are for illustration purposes only and may not be exact. Wa are not authorized Meade dealers.

Prices effective till Dec.10, 00 **Please address all inquiries and orders to ASTRO. DEPT. #55**

Your Credit Card Will Only Be Charged At Time Of Shipping For Items Actually Shipped

BBB MEMBER METROPOLITAN NEW YORK

ADORAMA INC.

42 WEST 18th STREET • NEW YORK, NY 10011

12

PHONE ORDERS ACCEPTED DAY OR NIGHT
- Mon–Thurs. 9 till 9:30 PM
- Fri. 9-1:45
- Sunday 9:30–6 EST

STORE HOURS:
- Mon.–Thurs. 9–6:30pm
- Fri to 1:30 • SUN 9:30–5:30

web:
www.adorama.com

ORDER TOLL FREE • US & CANADA
800-7-ADORAMA
800-723-6726

ORDERS & INFO **212-647-9800** | FAX **212-675-8715**

CUSTOMER RELATIONS • 800-815-0702
• Mon–Thur. 9–4:30, EST
E-mail: info@adorama.com

BINOCULARS

Adorama Provis Series Binoculars

Deluxe, Lightweight with enhanced Multi-Coating. Full-sized binoculars in a compact and lightweight high-quality cast-aluminum alloy housing with a soft leatherette covering.

- BAK-4 glass porro prisms.
- Full Multi-Coating. Every air-to-glass surface is multi-coated to increase light transmission, better image contrast and color balance
- Soft grey leatherette covering
- Threaded to accept tripod adapter
- Long Eye Relief. ideal for eyeglass wearers
- Roll down rubber eyecups
- Supplied with Deluxe Hard Carrying Case
- Rated "Exceptional Inspection Standard" by the Japanese J.T.I.I.

PROVIS Binocular	Eye Relief	Field of View	Near Focus	Size HxW	Weight oz.	Price
8x42	16mm	6.5°	16'	4.92" x 6.85"	22.2	**129.95**
7x50	23mm	6°	26'	6.42" x 7.24"	27.8	**109.95**
10x50	16mm	5.3°	26'	6.22" x 7.24"	27.8	**124.95**

NIGHT VISION

BINOCULARS

Compact Binocular 30,000X 4X Mag. **399.95**
30,000X Goggles 1X Mag. Focuses as close as 9" .. **599.95**

MONOCULARS

NOCX3 Explorer water Resistant 3.1X Mag. 15,000X .. **199.95**
NOCX5 Explorer water Resistant 5X Mag. 15,000X ... **274.95**
NONO3 Odyssey water Proof 3.1X Mag. 15,000X **249.95**
Lens Doubler .. **34.95** Camera Adapter **34.95**

TASCO

NV-360 **Monocular** **279.95**
Camera Adapter for 360 .... **49.95**

Night Owl Cyclops With Camera Adapter

- 15,000 Light Magnification
- 3.1x Image Magnification
- Premium performance and styling
- The highest quality optics designed and coated specifically for night time use
- Powerful integrated infrared illuminator ***164.95***

ASTRONOMY BOOKS

Books for Beginners

Nightwatch: Equinox Guide ...**24.95**
Astronomy: Self-Teach Guide **18.95**

Astrophotography & Imaging

CCD Camera Cook Book......... **29.95**

Observers' Handbooks

The Backyard Astronomer's Guide **29.95**
Burnham's Celestial Handbook 3 Volume Set **39.95**

Binocular Observing

Touring the Universe Through Binoculars **32.95**

Building Telescopes

Telescope Building w/Dobson Video Tape........ **39.95**

Star Atlases

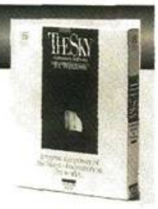
Sky Atlas 2000 Field Ed. **29.95**
Sky Atlas 2000 Deluxe New Ed. **44.95**
Laminated Sky Atlas 2000 Field Edition **64.95**
Bright Star Atlas 2000 .... **10.95**
Celestron Sky Map........ **16.95**
Atlas of Deep Sky Splendors 4th Edition **24.95**
Deep-Sky Field Guide to Uranometria 2000........ **49.95**

Night Navigator *$79.95*
The Electronic Star Locator

Locates and Identifies Constellations Quickly.

- Scientific patented computer tracking system to accurately locate and identify constellations, planets, and stars quickly and effortlessly.
- Innovative built-in digital electronic compass automatically plots your location.
- Motorized map delivery system for easy sky navigation.

ASTRONOMY SOFTWARE



THE SKY
for Windows 95

Version 5.0

Sky Level 2 or 3 .... **Call**
Sky GSC (CD ROM) Level 4........ **Call**

PROOPTIC BINOCULARS

These binoculars with their large objectives high quality BAK-4 prisms will provide you with breath-taking wide-field observation of astronomical objects as well as terrestrial viewing under low light conditions.

Now includes 25 YEAR WARRANTY

Each binocular is provided with a high quality Hard Case, Neck Straps and Rubber Eye-Cups.

70mm Jumbo Fully Multi-Coated Series

11x70 Jumbo – 4º field of view, 21mm eye relief, weighs 2.8 lbs. **159.95**
16x70 Jumbo– 3.6º field of view, weighs 2.8 lbs. **169.95**

80mm Giant Fully Multi-Coated Series

11x80 Giant – 4.2º field of view, 14mm eye relief, weighs 5.25 lbs. **249.95**
20x80 Giant – 3.3º field of view, 14mm eye relief, weighs 5.25 lbs. **259.95**

100mm Ultra Giant Series

The ultra large aperture of 100mm provides more than 50% more light gathering power than the standard 80mm Giant Binoculars.
For a delightful experience in astronomical viewing.
Both feature multi-coated optics, BAK-4 prism, built-in platform which mounts on a tripod.

14x100 Ultra Giant ...**849.95** **25x100** Ultra Giant .**899.95**

Provides Stunning Views of The Night Sky
At A Price Far Below What Giant Binoculars Typically Cost
...BUDGET - PRICED...
As Written Up In Sky & Telescope June 2000

FUJINON FMT-SX Binoculars

10x70

14x40 Techno Stabi........ **Call**
7x50 FMT-SX .... **Call**
7x50 FMTR-SX .... **Call**
7x50 FMTR-CSX R.C.with Compass .... **Call**
8x30 FMTR-SX R.C. .... **Call**
10x70 FMT-SX w/Case .... **Call**
16x70 FMT-SX w/Case .... **Call**
8x42 BFL........ **Call**
10x42 BFL .... **Call**

CD Waterproof

7x42 .... **Call** 8x42........ **Call**
10x42 .... **Call**

CANON

Image Stabilized

10x30 .... **Call** 12x36 .... **Call**
15x50........ **Call**
18x50........ **Call**

PENTAX PCF

7x50........ **Call** 8x40. .... **Call**
10x50........ **Call** 12x50. .... **Call**
16x50........ **Call** 20x60 .... **Call**

LEICA

w/USA Passport Warranty

10x50 BA ....**Call** 8x50 BA.....**Call**
12x50 BA........ **Call**
7x42 GEOVID BDA .... **Call**
7x42 GEOVID BD .... **Call**

KOWA

82mm Spotting Scopes (Body only)
TSN-821.**399.95** TSN-822 **364.95**
TSN-823.**814.95** TSN-824 **769.95**
82mm Scopes with 20-60X Zoom
TSN-821 with 20-60X Zoom..**639.95**
TSN-822 with 20-60X Zoom .**609.95**
TSN-823 with 20-60X Zoom**1059.95**
TSN-824 with 20-60X Zm..**1014.95**

Fieldscope Super 80

Super 80 with 20X-60X .... **Call**
Super 80 ED with 20X-60X .... **Call**

CELESTRON

GIANT MULTI-COATED

20x80 Delux........ **Call**

REGAL

8x42........ **Call** 10x50 .... **Call**

NEW NOBAL

8x32........ **Call** 8x42. .... **Call**
10x42........ **Call** 10x50 .... **Call**

ULTIMA SERIES

7x50........ **Call** 8x40. .... **Call**
10x50........ **Call** 8x56 .... **Call**
9x63........ **Call**

MINI M/C with Case

8x21........ **36.95**
10x25 ......**46.95** 7-16x25 .**64.95**
MONOCULAR– 8x25........ **34.95**

BUSHNELL

Discoverer 15-60 X60........ **179.95**
Camera Mount f/Discoverer ...**14.95**
Spacemaster **149.95**
Spacemaster Rubberized ...**163.95**
Spacemaster Kit w/15-45X, Tripod and Case........ **247.95**
Elite 60mmw/15-45X Zoom ....**Call**
Elite 70mm w/20-60X........ **Call**
Elite 80mm w/20-60X........ **Call**

PROOPTIC Astronomical Accessories

A unique combination of high quality and economical prices

Pro-Optic Plössl 1.25" Eyepieces

NEW Reduced Prices!

- Sharp detail • High contrast ghost-free images • Wide 50º apparent field of view (43º on the 40mm Plössl)
- 4 element optics
- Lens edges are blackened to keep out reflected light
- Accepts 1.25" filters.

MULTI-COATED PLÖSSL EYEPIECES

40mm......**39.95** 32mm......**39.95**
25mm......**29.95** 20mm......**29.95**
17mm......**29.95** 12.5mm....**29.95**
10mm......**29.95** 7.5mm......**29.95**
6.3mm......**29.95**

Short Tube Barlow

Double the power of any eyepiece with this Barlow. Only 2X" long. Works with all type of telescopes, including Refractors and Reflectors

only **$31.95**

Pro Optic 500mm f/5.6 Maksutov Telephoto/Spotting Scope

with High-Tech White Finish

Carry Case

Multi-coated to maximize contrast and sharpness and a built-in field flattener to reduce field curvature.

With its 500mm focal length, it is long enough for close-ups of far away objects but with the f/5.6 optics it is fast enough to be hand held, focuses as close as 5 feet.

With the addition of the SS500 Kit you can convert it to a 20X 90mm spotting scope. The SS500 kit includes a 45º 1.25" Erect Image Diagonal and a 25mm 1.25" Plossl

Pro-Optic 500mm f/5.6 lens **209.95**
Pro-Optic SS500 Kit (when purchased w/500/5.6)........ **49.95**
350mm f/4 Converter for 500/5.6........ **74.95**

15-45x Fieldstar Spotting Scope Outfit Fully Coated, 2.25° f.o.v. at 15x, Long Eye Relief (33mm @ 15x) weighs only 25 oz, • Rubber Coated includes Case & Table Top Tripod ***109.95***

New 15-45x Angle Spotting Scope Kit w/Case & Table Top Tripod 119.95

Pro-Optic Slow Motion Control ***29.95***

Make accurate slow motion adjustments in altitude and Azimuth. In addition the Pro-Optic SMC allows you to make major adjustments in elevation with a separate control knob.The Slow Motion Control fits any tripod with 1/4-20 thread.

Pro-Optic 45º Erect Image Diagonal

Provides an ideal 45º angle for erect image terrestrial viewing

45º Erect 1.25"........ **34.95**
45º Erect Hybrid (1.25" to .96")........ **34.95**
90º Star Diagonal 1.25"........ **34.95**
New Straight Through Erector (Porro Prism) **64.95**

EYEPIECE FILTERS 1.25"

Available in the following colors: 1A Skylight; 8 Yellow; 11 Yellow Green; 12 Deep Yellow; 15 Deep Yellow; 21 Orange; 23A Red; 25 Red; 47 Violet; 56 Light Green; 58 Green; 80A Lt. Blue; 82A Pale Blue; ND 0.3; ND 0.6

1.25" ....@. **9.95** Moon Filter 1.25" (ND 9X)........ **11.95**
Buy any 4 filters (1.25")...for only **34.95**
Buy any 12 filters........for only **99.95**

4 Piece Filter Set with Pouch
Set #1 includes: #12, 23A, 58 & 80A Packaged in a Pouch **34.95**
Set #2 includes: #11, 25A, 47 & 82A **34.95**

WE SHIP PROMPTLY. ALL TELESCOPES INCLUDE U.S.A. WARRANTY

No Surcharge for MasterCharge or Visa Purchases. Personal checks welcome, will ship without delay. Name must be imprinted on check, also include address, phone, and a copy of major credit card or driver's license for reference. Shipping, handling and insurance additional. 14 day money back guarantee less shipping, with packing and blank warranty card, except film and paper. We ship UPS. Some items special order. All orders are subject to acceptance and verification. Second hand dealer's license #802862. Pictures are for illustration purposes only and may not be exact. Wa are not authorized Meade dealers.

Prices effective till Dec.10, 00 **Please address all inquiries and orders to ASTRO. DEPT. #55**

VISIT US ON THE WEB AT WWW.ADORAMA.COM

PRODUCTS

Tasco StarGuide

Tasco has developed a telescope for children who are more adept at surfing the Internet than bagging Messier objects with a backyard telescope. The optics company has introduced a line of computer-guided telescopes that can automatically locate 1,800 or more celestial objects. The automatic feature, designed for beginners, eliminates the need for astronomical knowledge or mathematical calculations.

All but the most inexpensive StarGuide model offer a hand controller with scrolling text describing the object in view.

The scopes, which are available at Target stores in the United States, range in price from $149 (a basic model that does not include computerized go-to technology) to $629.

"Telescopes with computers create more hands-on learning," says Aaron Martin, an astronomy professor at Guilford Technical Community College in Jamestown, North Carolina. "It makes it simpler to locate objects in the sky. Even I had a hard time learning to navigate the sky."

The StarGuide telescopes are easy to assemble and set up. Each one comes with a Star Pointer finderscope that uses a red light-emitting diode (LED) display. The telescope computer has an "AutoAlign" function that makes calibration simple — even for first-time sky surfers. The computer enables the telescopes to find and track astronomical objects, avoiding the frustration of losing such objects as Earth rotates.

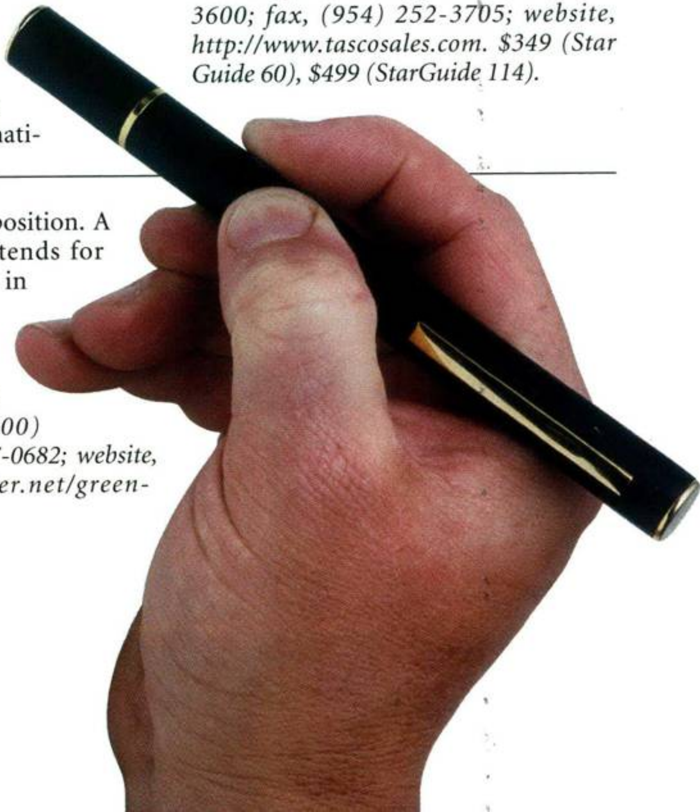
StarGuide 60

▶ This one is a 60mm f/12 refractor telescope. It is 28 inches long and comes with two eyepieces. An electric motor powered by eight AA alkaline batteries or a 12-volt AC adapter moves the telescope and runs its hand-held computer, which has red backlit buttons and a dual-line, 16-character liquid-crystal display screen with scrolling text. The computer also has a 1,800-celestial-object database and can automatically target and track those appearing in the night sky. The computerized "AutoAlign" function asks the operator to enter the date, time, and closest city, and the telescope automatically orients itself. Pressing the "Tour" key instructs the computer to find the best objects to observe that month and takes the user on a tour that comes with text readouts. The StarGuide also includes an RS-232 connector port that allows the user to control the telescope with a PC that has been loaded with software that comes with the telescope.

StarGuide 114

▶ This 114mm f/9 reflector telescope has a mirror instead of a lens, but it otherwise includes the same accessories as the StarGuide 60. However, for the $150 additional cost, the 114 provides much brighter views than the 60.

Tasco, 2889 Commerce Parkway, Miramar, FL 33025; phone, (954) 252-3600; fax, (954) 252-3705; website, http://www.tascosales.com. $349 (StarGuide 60), $499 (StarGuide 114).



Green Laser Pointer

▶ Laser pointers designed to help speakers making slide presentations at business meetings and lecture halls have become hits with astronomers. Laser pointers emitting light at 532 nanometers are popular because the human eye is more sensitive to this green light than red laser pointers operating at equivalent powers.

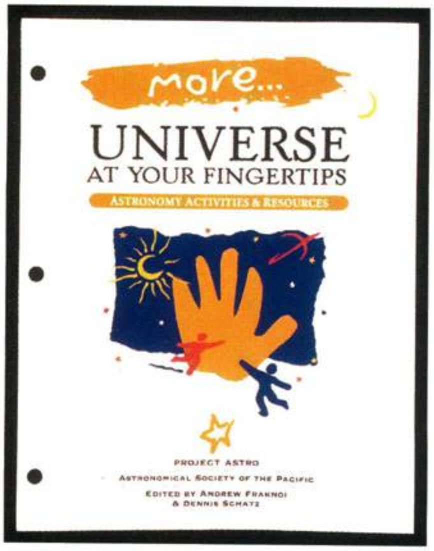
The Slimline GP5 is one such laser that astronomy instructors are using to point out stars. In the field, the laser saves time by allowing the user to simply point out an astronomical object he or she is talking about rather than pointing a finger and verbally describing the object's position. A shaft of green light extends for more than a mile, even in dim daylight.

DeHarpporte Trading Co., 6780 Vermar Terrace, Eden Prairie, MN 55346; phone, (800) 840-7829; fax, (621) 937-0682; website, http://www.laserpointer.net/greenlaspoin.html. $275.

More . . . Universe at Your Fingertips

▶ The Astronomical Society of the Pacific, a nonprofit organization, has published a 356-page loose-leaf companion to its earlier-published activity resource for teachers of grades 3–12. The new volume is titled *More . . . Universe at Your Fingertips: An Astronomy and Activity Resource Book.*

The earlier collection featured 90 hands-on activities for teaching basic astronomical concepts — from the phases of the moon to the expansion of the universe. *More . . . Universe* includes 27 supplemental classroom-tested activities, with each page three-hole punched and numbered to be added conveniently to the first edition.


more...
UNIVERSE
AT YOUR FINGERTIPS
ASTRONOMY ACTIVITIES & RESOURCES
PROJECT ASTRO
ASTRONOMICAL SOCIETY OF THE PACIFIC
EDITED BY ANDREW FRAKNOI & DENNIS SCHATZ

Astronomy educators Andrew Franknoi and Dennis Schatz edited both resource books. The publications were developed by Project ASTRO, a National Science Foundation-funded education program.

More . . . Universe has activities on the motion of the moon, Earth's seasons, tracking the planets, searching for meteorites, discovering what killed the dinosaurs, measuring the sun's rotation, finding variable stars, fingerprinting cosmic light sources, sorting galaxies, and more.

Astronomical Society of the Pacific, 390 Ashton Ave., San Francisco, CA 94112; phone, (415) 337-1100; fax, (415) 337-5205; website, http://www.aspsky.org. $24.95 (bulk discounts are available).

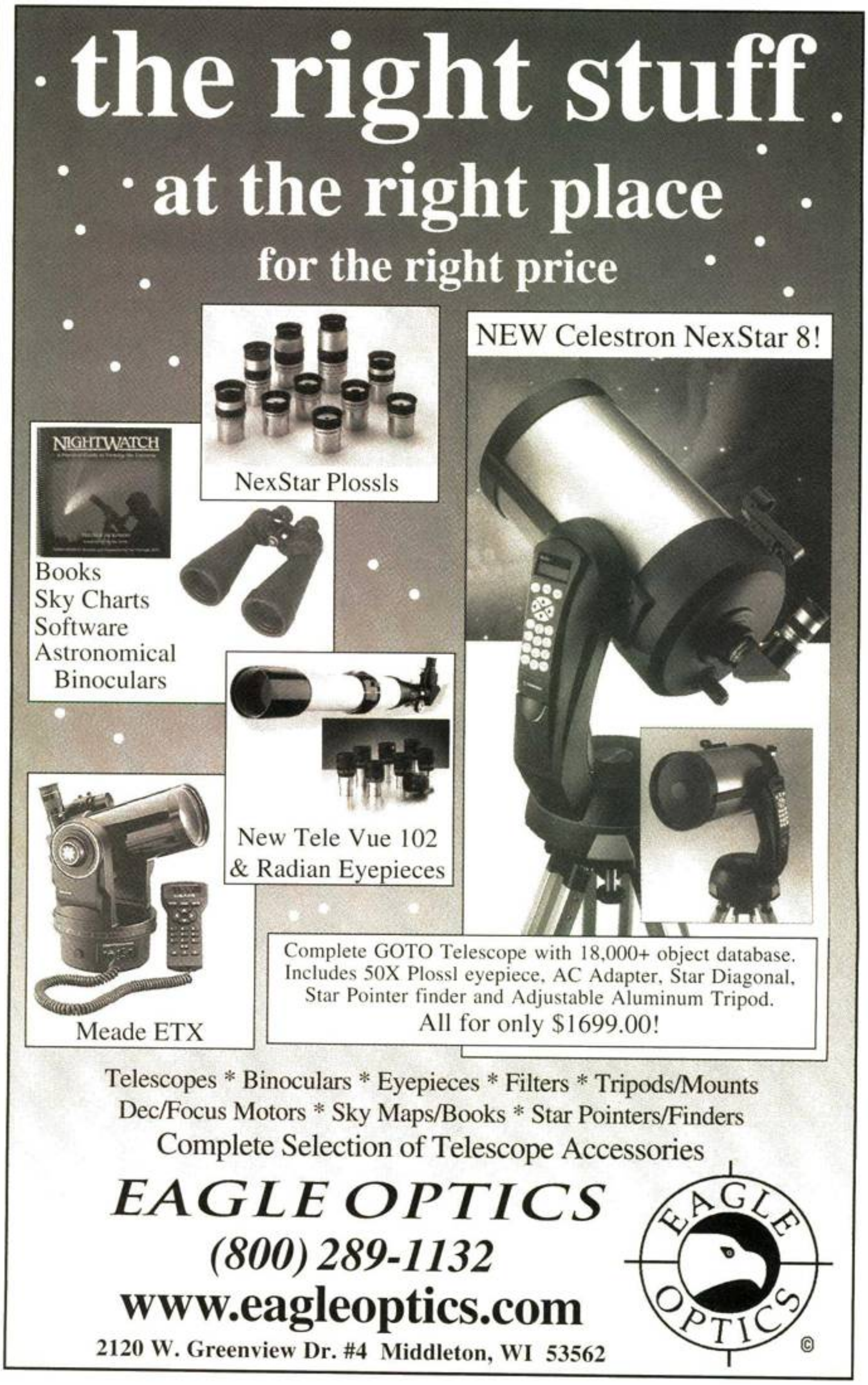
MASTER THE UNIVERSE

University of Western Sydney Nepean
Astronomy Internet Master

AIM

An exciting new international degree from Australia, suitable for those without formal training in Astronomy or Physics.

http://www.nepean.uws.edu.au/astronomy/
Phone: + 61 2 9678 7502
Fax: + 61 2 9678 7202
E-mail: a.hons@uws.edu.au


the right stuff
at the right place
for the right price

NEW Celestron NexStar 8!
NexStar Plossls
Books
Sky Charts
Software
Astronomical
Binoculars
New Tele Vue 102
& Radian Eyepieces
Meade ETX

Complete GOTO Telescope with 18,000+ object database. Includes 50X Plossl eyepiece, AC Adapter, Star Diagonal, Star Pointer finder and Adjustable Aluminum Tripod.
All for only $1699.00!

Telescopes * Binoculars * Eyepieces * Filters * Tripods/Mounts
Dec/Focus Motors * Sky Maps/Books * Star Pointers/Finders
Complete Selection of Telescope Accessories

EAGLE OPTICS
(800) 289-1132
www.eagleoptics.com
2120 W. Greenview Dr. #4 Middleton, WI 53562

ANNOUNCING . . .

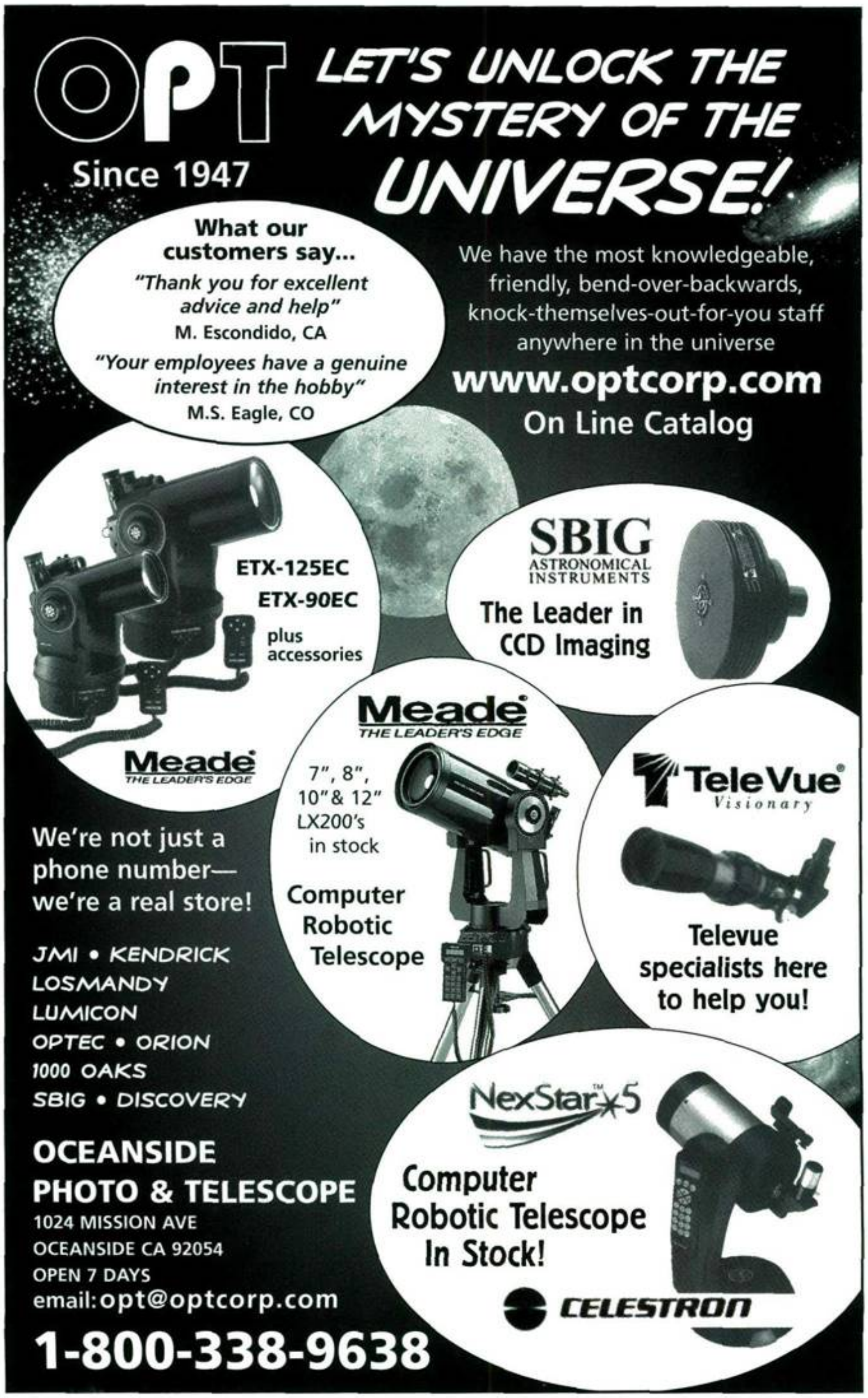
SUNSPOTTER™

THE SAFER SOLAR TELESCOPE

- This unique, wooden, folded-Keplerian telescope provides a much safer way to view the brilliant light of the sun compared to more common methods.
- Enables the user to track sunspots as they appear, move, and vanish and to trace the face of the sun comparing it from hour to hour and day to day.
- Unlike other ways of viewing the sun, the compact, sturdy Sunspotter is convenient, easy to set up, and fun to use.

VISIT OUR WEBSITE: WWW.STARLAB.COM

LEARNING TECHNOLOGIES, INC.
40 CAMERON AVENUE
SOMERVILLE, MA 02144 USA
TEL: 800-537-8703 OR 617-628-1459
FAX: 617-628-8606
E-MAIL: STARLAB@STARLAB.COM



OPT

Since 1947

LET'S UNLOCK THE MYSTERY OF THE UNIVERSE!

What our customers say...

"Thank you for excellent advice and help"
M. Escondido, CA

"Your employees have a genuine interest in the hobby"
M.S. Eagle, CO

We have the most knowledgeable, friendly, bend-over-backwards, knock-themselves-out-for-you staff anywhere in the universe

www.optcorp.com
On Line Catalog

ETX-125EC
ETX-90EC
plus accessories

Meade THE LEADER'S EDGE

SBIG ASTRONOMICAL INSTRUMENTS
The Leader in CCD Imaging

Meade THE LEADER'S EDGE
7", 8", 10" & 12" LX200's in stock
Computer Robotic Telescope

TeleVue Visionary
Televue specialists here to help you!

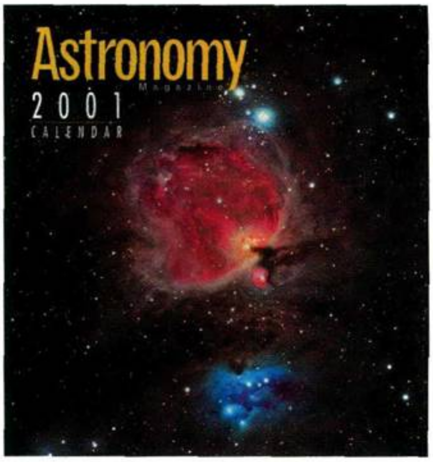
We're not just a phone number—we're a real store!

JMI • KENDRICK
LOSMANDY
LUMICON
OPTEC • ORION
1000 OAKS
SBIG • DISCOVERY

NexStar™5
Computer Robotic Telescope In Stock!
CELESTRON

OCEANSIDE PHOTO & TELESCOPE
1024 MISSION AVE
OCEANSIDE CA 92054
OPEN 7 DAYS
email: opt@optcorp.com

1-800-338-9638



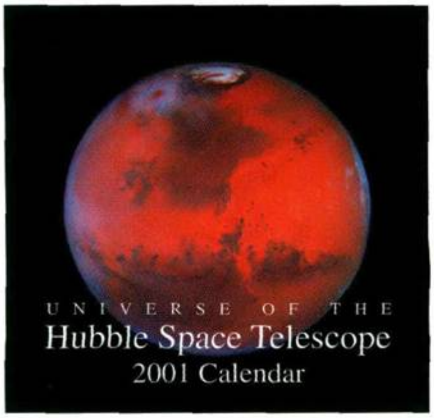
Astronomy Magazine 2001 Calendar

▶ *Astronomy* magazine's first calendar of the millennium includes striking 12-inch by 12-inch images of the Orion Nebula, Mars, spacewalking astronauts, a partial solar eclipse, and other astronomical objects. Each month's image is explained in an accompanying essay. The *Astronomy 2001 Calendar* also includes seasonal star charts and information on how to view many of the year's celestial events.

Kalmbach Publishing Co., 21027 Crossroads Circle, P.O. Box 986, Waukesha, WI 53187-0986; phone (800) 558-1544, extension 818; fax, (262) 798-6592; website, http://www.astronomy.com. $12.95 (shipping charges vary).

Universe of the Hubble Space Telescope 2001 Calendar

▶ The *Universe of the Hubble Space Telescope 2001 Calendar* features NASA and Space Telescope Science Institute images of Mars, Saturn, Jupiter, galaxies, nebulae, and other objects. Astronomers using Hubble obtained the image of Mars in early 1999 when



the Red Planet was only 54 million miles (87 million km) from Earth. Detailed descriptions accompany all the calendar's pictures, which Astrographics Publishing printed on 12-inch by 12-inch paper. The company also sells other calendars, including *Earth from Space 2001*. All the calendars can be purchased at the company's website.

Astrographics Publishing, 85 Oakside Dr., Smithtown, NY 11787; phone, (888) 827-8768; website, http://www.astrographics.com. $12.95 each, or $10 each for two or more, plus $3.75 shipping and handling per address in the U.S. (Overseas airmail shipping is more).

STAR GAZER
Version 4.0 Beta
© 2000 Belew Spruce Software

Star Gazer

▶ Star Gazer became a popular educational astronomy software program because it is easy to use, generates star charts, and contains an image archive and a history of spaceflight. The updated version 4, released in November, promises to enhance the software's reputation. Windows and Mac versions are available, as is a hybrid CD-ROM that works on either a PC or Mac.

To get started, operators can choose a city among 450 listed worldwide, pick one from an interactive map, or simply enter their latitude and longitude. The display then allows the user to create a star chart with layers of information, such as constellations, Messier objects, galaxies, the sun, moon, and planets. The software is available through Belew Spruce Software's website or through a variety of educational supply catalogs.

Belew Spruce Software, 806 Buchanan, No. 115, Boulder City, NV 89005; phone, (702) 565-8614; website, http://www.belewspruce.com. $29.95.

"The Edmund Astroscan... features ..."out-of-the-box" ease of use and transport. ...time-tested design is superior, ...its far better optics give respectable views of highlights like Jupiter's bands and Saturn's rings when mated with an optional 8 to 10mm eyepiece. ...will keep a budding stargazer going for many months without having to purchase other atlases or catalogs."
by Joshua Roth – Sky & Telescope, March 2000

REACH OUT AND EXPLORE THE NIGHT SKY WITH OUR FAMOUS, AWARD WINNING
ASTROSCAN®
WIDE-FIELD TELESCOPE 2001

The ideal first telescope for your entire family!

Unique award-winning compact design allows you to cradle the Astroscan® in your arms or glide it smoothly in its table-top base. Highlights of this scope are its extra wide 3° field and its superb light-gathering ability with a large 4 1/8" clear aperture to resolve panoramic vistas. An optional image erector enables this versatile scope to view land objects.

Telescope Package #AE02-001 for only $299.00 includes:
- Astroscan® 2001 Telescope
- Padded Table-Top Base
- Dust Cap and Carry Strap
- 5 Year ES Limited Warranty
- Instrument-Quality 28mm RKE® Eyepiece
- Open Sight Target Finder
- 36 Page Users Manual
- 40 Page "Sky Guide"

NEW LOWER PRICE! $299⁰⁰

New 100 page color catalog has a wide assortment of telescope accessories and scientific products for the entire family.
Order online or call today toll free.

FREE CATALOG
800-728-6999
www.scientificsonline.com

Major credit cards accepted.
We back our products with a 30 day unconditional guarantee.

SCIENTIFICS
www.scientificsonline.com

ES
Edmund Scientific Co.
CONSUMER SCIENCE DIVISION
Dept. D00C-C821, 101 East Gloucester Pike, Barrington, NJ 08007-1380
Tel: 856-547-3488 • Fax: 856-547-4826 • E-mail: cons_order@edsci.com
® Scientifics and Astroscan are registered names of the Edmund Scientific Company

Weather Stations

Our popular Weather Monitor II is now $100 less!

The professional weather station for you and your family. Barometric pressure, temperature, humidity, wind speed and direction, rainfall, and more. Wireless or cabled, starting at just $195. FREE catalog.

Davis Instruments
3465 Diablo Ave,
Hayward, CA 94545
800-678-3669
www.davisnet.com

AST1100

IDENTI-VIEW™
PREMIUM GLASS SOLAR FILTERS
- SAFE • HIGH QUALITY
- STRICT CONTROL STANDARDS
- LIMITED LIFETIME WARRANTY

CLASS "A"
Color band - blue. Class "A" filters are made with the same premium quality polished glass and multi-alloy coating as Class "B". An additional steel alloy added to the coating process makes our Class "A" filters extremely scratch and fade resistant. Excellent for visual and photographic use. Light transmission is 1/1000th of 1%.

CLASS "B"
Color band - white. Class "B" filters are made with polished glass and multi-alloy coating. These filters offer great durability and will provide many years of service and enjoyment with normal use. Can be used visually and for photography. Light transmission is 1/1000th of 1%.

CLASS "C"
Color band - red. Class "C" filters are specifically coated to a lighter density (ND-4). They are for photographic use only. This filter is intended for use by professionals and serious hobbyists. Light transmission is 1/100th of 1%.

ORDERING INFORMATION
1. State scope brand and model number, aperture and outside diameter with filter class and price.
2. Make check or money order payable to J.M.B. Inc. All foreign checks must be payable through a U.S. bank.
3. Shipped free within the continental United States. All others add $5.50 Shipping and Handling per filter. Michigan residents add 6% sales tax, allow 2-3 weeks for delivery.

VISA J.M.B. INC. MasterCard
736 Oak Glen Circle • Fall Branch, TN 37656
(423) 348-8883 • FAX (423) 348-6389
"Imitated but never duplicated"

www.e-scopes.cc
Discount Scopes and Accessories

Coulter Optical®
Div. of MURNAGHAN Instruments Corp.
1781 Primrose Ln.
West Palm Beach, FL 33414
For orders or information:
Call: (561) 795-2201
Fax: (561) 795-9889
www.coulteroptical.com
CCD Cameras & Accessories

THE INCOMPARABLE ODYSSEY® available in 8, 10 & 13.1 inch

VALUESCOPES™
8" F/6 Dobsonian
6" F/8 Dobsonian

100's of Eyepieces & Accessories

ASTRON™
8" F/4.5 Equatorial Reflector
6" F/5 Equatorial Reflector

ASTRON™
100mm F/10 Equatorial
90mm F/11 Equatorial

ASTRON™
90mm F/5.6 ShortScope™
Equatorial

VALUESCOPES™
4.5" F/8 Reflector
90mm F/11 Refractor

Serving amateur astronomy since the 1960's

BOOKS

The Book of the Cosmos: Imagining the Universe from Heraclitus to Hawking

Dennis Richard Danielson, ed., 556 pages, Helix Books/Perseus Publishing, Cambridge, Mass., 2000; ISBN 0-7382-0247-9; hardcover, $35.

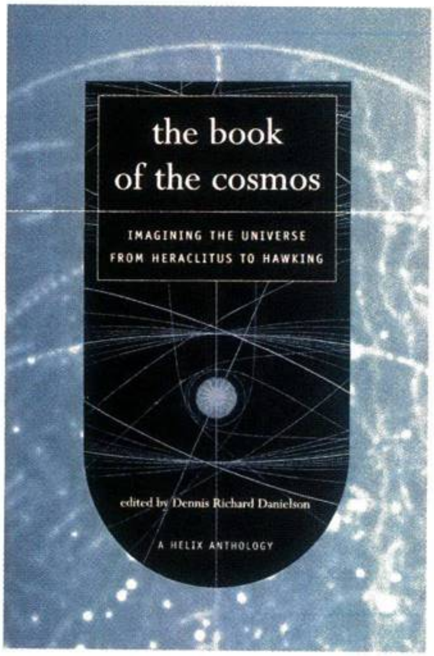
▶ What is the cosmos? How did it come into being? What is our place in it? With ample room for interpretation, these three basic questions inspire poet, priest, and physicist alike. In *The Book of the Cosmos*, Danielson establishes a forum where the cosmological thoughts of the literati and the scientific intelligentsia peacefully coexist. He triumphs with the successful marriage of religious, literary, and scientific prose under a single cover.

Danielson, an English professor at the University of British Columbia in Vancouver, Canada, realizes that "imagination is something not less vital to good science than to good literature." He discovered that the pursuit of cosmological questions binds Cotton Mather to Isaac Newton, John Milton to Martin Rees. Perhaps the pursuit joins us all.

With 85 concise chapters — each a separate "telescope of the mind" — *The Book of the Cosmos* chronicles the progress of Western cosmological thought. The works of Claudius Ptolemy, Dante Alighieri, Nicholas Copernicus, Maria Mitchell, Vera Rubin, George Bernard Shaw, Edwin Hubble, Arthur C. Clarke, Stephen Hawking, and many others bring the universe of each writer's lifetime into focus.

Danielson's selection of readable — not critical — texts avoids making the book unduly academic. His chronological approach, with excerpts from the *Torah* to the cutting-edge musings of modern cosmologists, provides many points of entry for readers with varied interests. Nonetheless, aficionados of all things cosmological will enjoy this cover-to-cover tour.

Perhaps the most interesting chapters are those that juxtapose the writings of dissimilar individuals. In one, Heraclitus and Parmenides debate the relative importance of change and permanence. In another, John Calvin and Johannes Kepler converge on a


the book of the cosmos
IMAGINING THE UNIVERSE FROM HERACLITUS TO HAWKING
edited by Dennis Richard Danielson
A HELIX ANTHOLOGY

prescription for dealing with conflict between scripture and scientific discovery. And in another, Gottfried Wilhelm Leibniz and Samuel Clarke lock horns in their opposing interpretations of Newtonian physics.

The pages of *The Book of the Cosmos* also resonate with the voices of giants who historians of science rarely acknowledge. Rubin, Mitchell, Annie Jump Cannon, Agnes Mary Clerke, Aphra Behn, Cecilia Payne-Gaposchkin, and Mary Fairfax Somerville remind us that brilliant women have long attempted to avoid the oppressive shadows cast in a male-dominated field. Likewise, Nicole Oresme, who predicted Earth's rotation long before it was popular, and Fred Hoyle, who derisively coined the term "Big Bang," show us the value in their refusal to be swayed by popular opinion.

The book also exhibits several weaknesses. At times, Danielson's presence is distracting. While he graciously includes brief biographical information for each contributor, he also injects commentary. His explanations, intended to clarify and provide context, occasionally disrupt the flow and try too much to influence readers.

Danielson admits to excluding the cosmological contributions of non-Western cultures in an effort to corral an otherwise encyclopedic volume. Despite subtle points of departure and

F. C. Meichsner Co., Inc.

Our 81 years of experience and knowledge will help you get the best optics for your money!

☆ Celestron
☆ Meade
☆ Tele Vue
☆ Takahashi
☆ Questar
☆ Miyauchi
☆ Fujinon
☆ Nikon
☆ Swift
☆ Bushnell
☆ Used Equipment
☆ Repair Service
☆ Large Showroom
☆ Worldwide Shipping
☆ Free Price List

☆ Accessories Always in Stock • Call for Monthy Specials

Call us at: **(800) 321-VIEW! (8439)**
Fax: 617-426-0837 (24 hours)
E-Mail: Meichs@aol.com
Visit us at: **182 Lincoln Street, Boston, MA 02111**
Web site: http://www.meichsner.com

CELESTRON

REFRACTORS

60 Altazimuth	$99
60 Equatorial	$159
80 Equatorial	$349
C102-HD	$549
CR-1500-HD	Call

REFLECTORS

Table Top 76	$99
76 Equatorial	$159
114 Firstscope	$299
114 Short	$229
C150-HD	$549
6" Star Hopper	$319
8" Star Hopper	$399

NEXSTARS

NexStar 60-GT	$299
NexStar 80-GT	$399
NexStar114-GT	$499
NexStar 5	$1199
NexStar 8	$1699

SCHMIDTS

G-5	$699
G-8	$999
Celestar 8	$1099
Deluxe	$1699
Ultima 2000	$2699
G-9.25	$1349
CM-1100	CALL
CM-1400	CALL

EYEPIECES

Plossl 3.6, 6, 8, 10	$39
Plossl 13, 17, 25	$39
Plossl 32, 40	$59
Ultima 5, 7.5, 12.5	$79
Ultima 18, 36	$89
Ultima 35, 42	$109
LV 6, 10	$105
LV 5, 9, 15	$105
LV 2.5, 4, 12	$116
AXIOMS	CALL

NEW ASTRO OPTICS PRODUCTS

WORLD'S LARGEST BINOCULARS
30 x 180
$4,999

REFRACTORS

- Achramatic Objective
- Heavy Duty EQ Mount
- Aluminum Tripod
- 26mm Super Plossl
- 90º Star Diagonal
- 6X30 Finder Scope

120mm f/8.3	$549
127mm f/8.9	$799

ASTRO STUFF

VISIT US ON THE WEB!

Mid-America's Largest Astronomy Showroom!
www.astrostuff.com

SECURE ONLINE ORDERING!

Info: (501) 331-3773 • **Order: 1-877-739-2787** • FAX: (501) 331-3131
1591 Pollard Road, Dover, Arkansas 72837

STOCKING MEADE DEALER

M51 CCD Image
© Bob Bell 1992

M1 CCD Image
© Bob Bell 1998

What in the World *Order 24 hours a day www.BuyaTelescope.com*

Getting a Start in Astronomy?
Everyone has to start somewhere. ***What in the World*** can help you make the right decision. Why settle for department store advice when you can talk to knowledgeable sales people?

Want *ADVANCED* Meade telescopes?
We can provide you with the full line of Meade telescopes and accessories. We stock small refractors, most sizes of Dobsonians, **GOTO** 90mm and 125mm scopes and SCTs. We also specialize in Meade's computerized telescopes and CCD cameras.

Want a Celestron SCT?
As a *Showcase dealer,* ***What in the World*** provides the full line of first class Celestron optics at competitive prices. From the popular **Celestar** series to the **Ultima 2000** GOTO scope to the German equatorially mounted SCTs **G3** to **CM1400**, we stock most models. We also stock the amazing ***NEW*** **GOTO NexStar Series**.

Ready for Astrophotography?
Astrophotography can be very rewarding. It can also be very frustrating! ***What in the World*** can help you choose the right equipment. Our more than **9 years of CCD imaging experience** can help you avoid mistakes. We are a master distributor for **SBIG** and also sell **Meade** and **Apogee** CCD cameras.

Heard about the Accu-Focus™?
What in the World has developed (pat. pend) this got-to-have tool for collimating your optics, making tack sharp CCD images possible and even enhancing planetary viewing! The 8" SCT Accu-Focus™ starts at just **$39.95.**

Need a printed catalog?

Want to build an observatory?
Visit ours at *www.WhatintheWorld.com*
ORDER TOLL FREE
(888) 942-8967
7 Days a week 10AM-6 PM PST

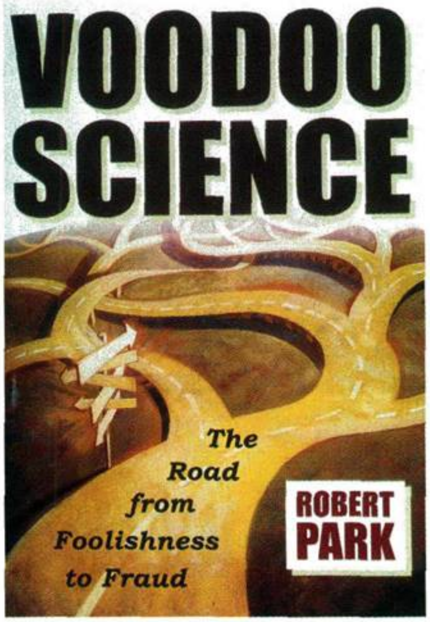
PO Box 1767
Lake Arrowhead, CA 92352
Info (909) 337-5080 Fax (909) 336-9708
$6 Minimum freight. Freight charges are nonrefundable. Restocking charges may apply to returns for credit or to items returned used or damaged. Prices subject to change without notice.

criticism, Danielson successfully topples academic barriers with this vast body of cosmological writings. He helps shatter the myth that literature and science are fundamentally immiscible — intellectual oil and water. Danielson makes the juxtaposition of Poe and Einstein as natural as placing peanut butter with jelly. — *William Schomaker, associate editor*

Voodoo Science: The Road from Foolishness to Fraud

Robert L. Park, 230 pages, Oxford University Press, New York, 2000; ISBN 0-19-513515-6; hardcover, $25.

▶ Park's witty book provides an eye-opening look at the importance of questioning what we read in newspapers, magazines, and what we see and hear on television. Park, director of the American Physical Society and the former chairman of the Department of physics at the University of Maryland, exposes the consequences of the media promoting science as entertainment.



The ten chapters of *Voodoo Science* cover topics ranging from aliens and space colonies to limitless energy sources and vitamin supplements. In

The Webweaver Picks

Did this month's articles whet your appetite? Ohio University offers more: http://www.phy.ohiou.edu/~dutta/notes/notes.html

This dish, "Foundations for Cosmological Thought" is at George Mason University: http://www.physics.gmu.edu/classinfo/astr103/CourseNotes/ECText/ectcn103.htm

Crave something spicier? Click on "Determining the Extragalactic Distance Scale" at Northwestern University: http://annie.astro.nwu.edu/labs/m100/

Insatiable astrophysics epicureans can fill up on relativity and Poincaré Symmetry at the University of Idaho: http://www.phys.uidaho.edu/~pbickers/Courses/310/Notes/book/book.html

Bon appétite.

You've never seen anything like it!
Experience the Largest, Most Complete Optical Supermarket in the World.

Scope City

Scope City Locations / Showrooms
SIMI VALLEY, CA: 730 Easy Street, (805) 522-6646
SHERMAN OAKS, CA: 14324 Ventura Blvd., (818) 789-5805
COSTA MESA, CA: 3033 S. Bristol, (714) 957-6900
SAN DIEGO, CA: 4766 Clairemont Mesa Blvd., (858) 277-6686
LAS VEGAS, NV: 4825 W. Flamingo Rd., (702) 947-2673
SAN FRANCISCO, CA: 350 Bay Street, (415) 421-8800

Save up to 45%
All Major Brands at discount prices

Buy
Sell
Trade
Service

MAIN OFFICE: 730 Easy Street,
Simi Valley, CA 93065, (805) 522-6646

Scope City / Mail Order
P.O. Box 440, Simi Valley, CA 93062
TEL: (805) 522-6670
www.scopecity.com

GET THE MOST FROM YOUR NEW GOTO SCOPE.
PLUG IN TO THESKY.

Hang up the hand paddle and plug in to the big picture with TheSky™ Astronomy Software. Point, click and go to any destination. Direct telescope control through your computer. It's that simple, that elegant. TheSky — the software astronomers use.

THESKY
VERSION 5
Astronomy Software
1.800.843.7599

dec7-1 - TheSky Astronomy Software
File Edit View Orientation Data Tools Telescope Help
Setup...
Link
Digital Setting Circles
Line Editor...
Motion Controls... Alt+M
Options
Server Settings...
Object Information
General Multimedia Utility Telescope
Object
D:\Program Files\Software Bisque\T...
Vulpecula
Pegasus
Delphinus
Equuleus
Aquarius
Capricornus
Sagittarius
Piscis Austrinus
Microscopium
Corona Australis
Scorpius
Telescope
SE
South
SW
Display the telescope motion controls
GOTO
bisque.com
Designed for Microsoft Windows NT Windows 95
Mac

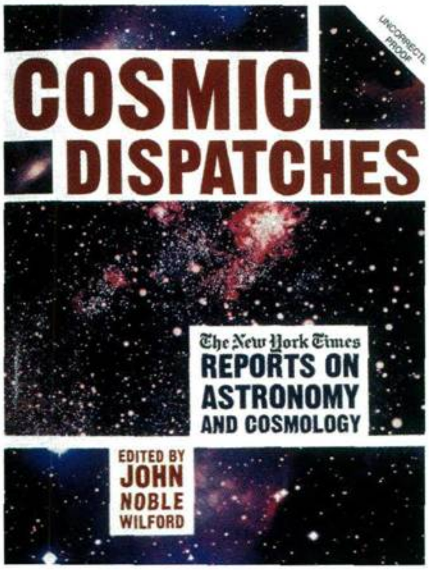
THESKY. LEVEL II. NICELY APPOINTED. $129.

THESKY IS A REGISTERED TRADEMARK OF SOFTWARE BISQUE

Software Bisque 912 Twelfth Street, Golden, Colorado 80401 303.278.4478

SOFTWARE BISQUE

each case, Park presents quantitative arguments against the public's instant acceptance of sensationalized science information. *Voodoo Science* takes an analytical approach to science reporting by the popular media while also remaining an interesting, easy read. It's bound to convert some unquestioning believers of media reports into skeptics. The book won't sway everyone. After all, says Park, "It is an axiom in the publishing business . . . that pseudoscience will always sell more books than the real science that debunks it."


UNCORRECTED PROOF
COSMIC DISPATCHES
The New York Times
REPORTS ON ASTRONOMY AND COSMOLOGY
EDITED BY JOHN NOBLE WILFORD

Cosmic Dispatches, *The New York Times* Reports on Astronomy and Cosmology

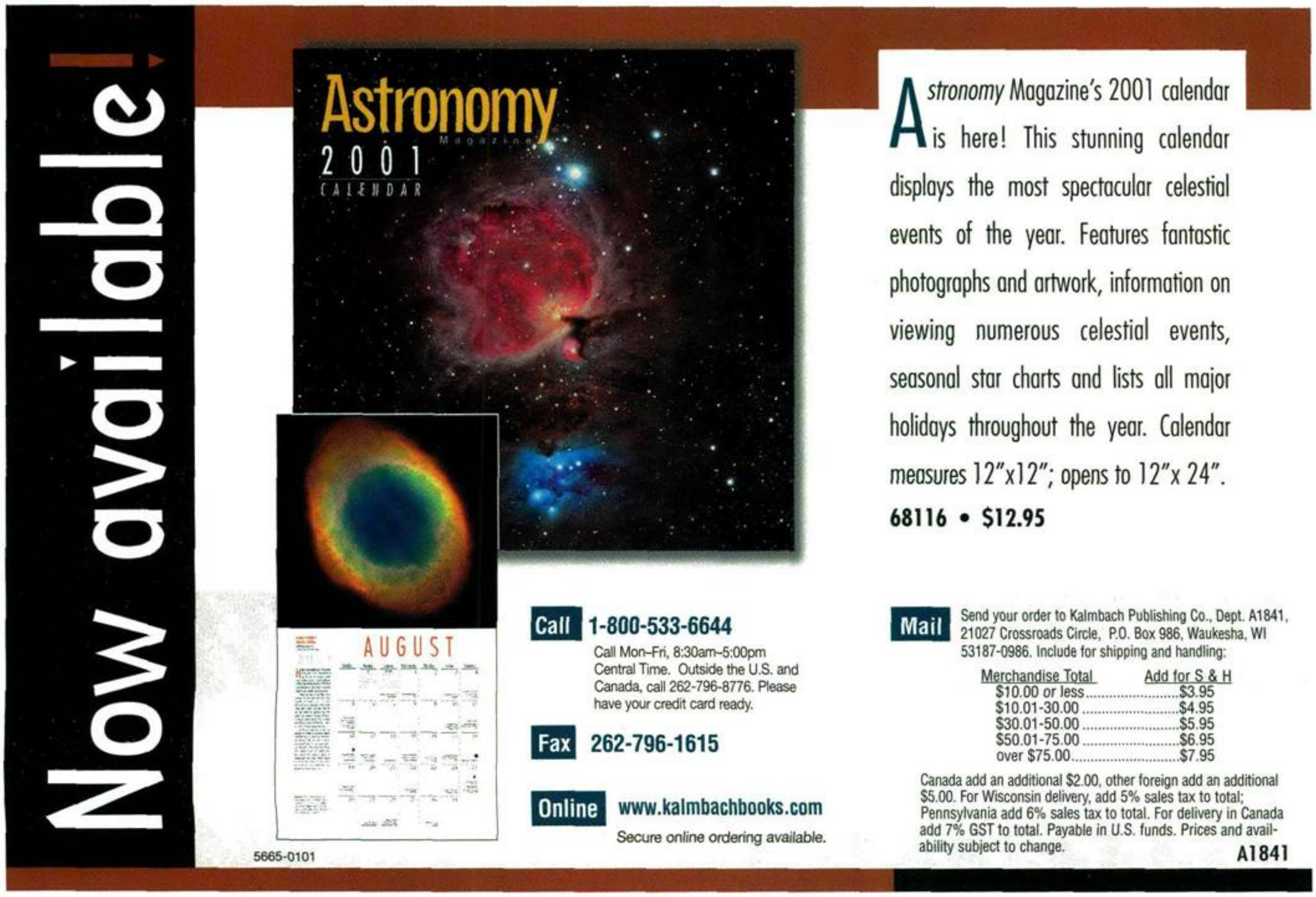
John Noble Wilford, ed., W.W. Norton, New York, 2000; ISBN 0-393-04937-X; hardcover, $26.95.

▶ *Cosmic Dispatches* is a compilation of *New York Times* essays on astronomy and cosmology. While most of the essays were written by Pulitzer Prize winning *Times* science writer Wilford, there are pieces by other *Times* staffers as well. Each of the 12 chapters, grouped by subject, includes at least three essays published between March 1991 and February 2000. Introductions to each chapter explore the amazing astronomical developments in the past decade and include glimpses of the human side of these discoveries.

Wilford and his colleagues at the *Times* also explore the unanswered questions scientists themselves often pose. Each piece combines astronomical history, current research, and popular speculation. Fans of the weekly "Science Times" section of the paper will no doubt want to add *Cosmic Dispatches* to their libraries. A

PRODUCT INFO

Suppliers should send announcements and color photographs to Star Stuff, P.O. Box 1612, Waukesha, WI 53187, or e-mail starstuff@astronomy.com. *Astronomy* assumes no responsibility for the product information supplied by manufacturers. Prices are retail and subject to change without notice. Check *Astronomy*'s website for further product updates — http://www.astronomy.com



Astronomy Magazine's 2001 calendar is here! This stunning calendar displays the most spectacular celestial events of the year. Features fantastic photographs and artwork, information on viewing numerous celestial events, seasonal star charts and lists all major holidays throughout the year. Calendar measures 12"x12"; opens to 12"x 24".

68116 • $12.95

Call 1-800-533-6644
Call Mon–Fri, 8:30am–5:00pm Central Time. Outside the U.S. and Canada, call 262-796-8776. Please have your credit card ready.

Fax 262-796-1615

Online www.kalmbachbooks.com
Secure online ordering available.

Mail Send your order to Kalmbach Publishing Co., Dept. A1841, 21027 Crossroads Circle, P.O. Box 986, Waukesha, WI 53187-0986. Include for shipping and handling:

Merchandise Total	Add for S & H
$10.00 or less	$3.95
$10.01-30.00	$4.95
$30.01-50.00	$5.95
$50.01-75.00	$6.95
over $75.00	$7.95

Canada add an additional $2.00, other foreign add an additional $5.00. For Wisconsin delivery, add 5% sales tax to total; Pennsylvania add 6% sales tax to total. For delivery in Canada add 7% GST to total. Payable in U.S. funds. Prices and availability subject to change.

A1841

Astronomy's Marketplace

Welcome to the MARKETPLACE section in ASTRONOMY Magazine. These pages are specifically designed to be an affordable and highly effective way for you to market astronomy-related products or services. Call Michael Ellis at 888-558-1544, ext. 636 to place your advertising message here.

AFRICAN ECLIPSE 2001
from 3-17 days
Primary Observation site, ZAMBIA

ECLIPSE CRUISE 2002
Sydney - Melbourne - Adelaide - Hobart
Join BUZZ ALDRIN & Steve Last

TRAVEL WIZARD
7788 University Ave., La Mesa, CA 91941
1-800-708-7677
(619) 464 -1946 • FAX: 462-5278
glow in the dark eclipse T-shirts & patches
www.travelwizardtravel.com

EUROPE'S PREMIER WEBSITE
http://www.scsastro.co.uk
SCS ASTRO

NEW AUTHORS
PUBLISH YOUR WORK
ALL SUBJECTS CONSIDERED
WRITE, OR SEND YOUR MANUSCRIPT TO:
MINERVA PUBLISHING CO.
1001 BRICKELL BAY DR., # 2310, MIAMI, FL 33131

PEGASUS OPTICS
Precision-Made Parabolic Mirrors
18" - 25" Diameter

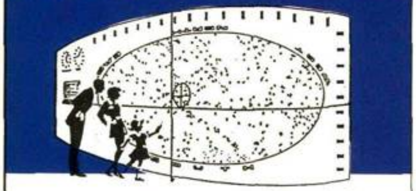
- *2" Thickness Pyrex (16 - 25") Precision-Annealed*
- *Unconditional, Written Lifetime Warranty*
- *Guaranteed to Surpass Diffraction-Limited Criteria*
- *Quantitative Certification with Surface/Wavefront Graphs*
- *3.1 - 4.0" 98% diagonal mirrors*

Web site at http://www.icstars.com/pegasus
e-mail: hallj@admin.hillconet.com

"You'll see the difference" -John Hall, Owner

TEL/FAX: (830) 563-2578
P. O. Box 1389
Bracketville, TX 78832

Buy a Star ★ Name a Star



On the exclusive MSAS **Star Atlas**
Soon to be placed in the newly opened MSAS Astronomy Village
Receive a certificate of record and more...
Starting at only $25.00
(909) 336-1699
http://www.mountain-skies.org
Mtn. Skies Astronomical Society- Box 1169 - Lk Arwhd,CA. 92352

ASTRO HAVEN
Non-Rotating Clamshell Domes

- 7' or 12' Diameter
- Low Maintenance
- Fast Erection
- Low Cost

Full 180° Viewing Radius
12 ft
7 ft
ASTRO HAVEN

#113 5778 Production Way, Langley,
British Columbia, Canada V3A 4N4
www.sales@astrohaven.com
Phone (604) 539-2208
Fax (604) 539-2209

CELESTRON®

Firstscope 80 - $299.99
Firstscope 114 - $349.99
DS-70EC - $349.99
ETX-60AT - $299.99
MEADE

no need to
SEARCH THE SKY
for your equipment

Celestron
Nextstar 60GT - $299.99
G5 with motor drive - $749.99
Celestar 8 - $1099.99

Meade
DS-114EC - $399.99
DS-90EC - $499.99
ETX-90EC - $595.99

AES®
5710 W. Good Hope Rd • Milwaukee, WI 53223
Local line: (414)358-0333 • info@aesham.com

1-800-558-0411
www.aesham.com

PARFOCAL BRANDON® OCULARS

Effective focal lengths: 8, 12, 16, 24 and 32mm

STEP UP TO BRANDON!

#1 for Contrast

VERNONSCOPE & company
Division of
Gould Precision Optics Inc.
151 Court Street
Binghamton, NY 13901
Toll Free in US
888.303.3526
☎ 607.722.5697
607.722.7939
www.vernonscope.com

Astronomy's
Marketplace

METEORITES!

Irons. Stones. Stony-irons. Tekites.
Quality display and study specimens.
Space jewelry, books, slides,
Authenticity guaranteed.
Color Catalog $2.

CATCH A FALLING STAR!

Bethany Sciences
P.O. Box 3726-A
New Haven, CT 06525
(203)393-3395

CORRECT RELATIVE MOTION OF ALL NINE PLANETS
SEMI-PRECIOUS STONES DEPICT PLANETS AND SUN
BATTERY OPERATED
WARRANTY AND MANUAL INCLUDED
$195.00 + S & H

THE WANDERERS ORRERY

SCIENCE ART CO 800-238-7310 scienceartco.com

ASTRO-PHYSICS

High-quality instruments for discriminating observers and astrophotographers

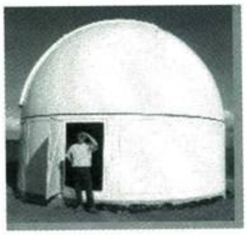
Refractors- 105,130,155 mm dia.
Go-To German Equatorials
Visual and Photographic
Accessories

155 Starfire EDFS with 2.7" Focuser,
900GTO German Equatorial
Accessories

11250 Forest Hills Rd.
Rockford, IL 61115 USA
Ph: 815-282-1513, Fax: 815-282-9847
www.astro-physics.com

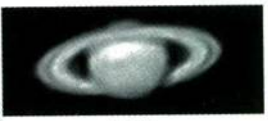
TRACKING for DOBS

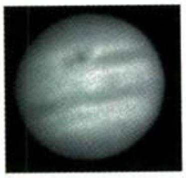
*** High power observing and group viewing**
***Astro-imaging with NO field rotation**
call write or e-mail for free brochure
EQUATORIAL PLATFORMS 530-274-9113
15736 McQuiston Lane **Grass Valley CA 95945**
tomosy@nccn.net **www.Astronomy-Mall.com**



'SIRIUS' direct from **Australia**

Sizes - 7'6" or 11'6" or 22'0" dia.
Solid Fibreglass, whisper quiet. Mechanised dome rotation and hatch openings available.
Visit www.siriusobservatories.com
e-mail info@siriusobservatories.com



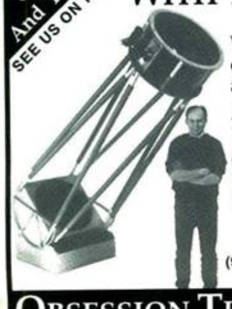


Entry level CCD imaging
Includes camera, software and everything needed for prime focus & eyepiece projection in 24 bit color
407-259-6498

SAC
P.O. Box 360982
Melbourne, Fl. 32936
wsnyder@sac-imaging.com

SACIV
$224

www.sac-imaging.com



OBSESSED WITH THE BEST?

We are. Nothing else comes close to an Obsession.

Apertures from 15-30 inches.

Get Obsessed now. Brochure and a 2hr. video, just $2.

PO Box 804a
Lake Mills, WI 53551
(920) 648-2328 • Fax also

OBSESSION TELESCOPES™
www.obsessiontelescopes.com

SINGLES IN SCIENCE

and others interested in science/nature are meeting through *Science Connection*

800-667-5179
www.sciconnect.com/

AMATEUR ASTRONOMERS!
WANT TO START YOUR OWN BUSINESS?

Consider investing in a STARLAB Portable Planetarium System (starting at $10,500) and share your astronomy enthusiasm with schools, scouting groups, parents and more! Great earning potential!

LEARNING TECHNOLOGIES, INC.
40 CAMERON AVENUE, SOMERVILLE, MA 02144 USA
PH: 800-537-8703 OR 617-628-1459 · FAX: 617-628-8606
E-MAIL: STARLAB@STARLAB.COM · WWW.STARLAB.COM

Unique Holiday Gift
One-of-a-Kind
Artistic Rendering of the Cosmos
Any Night, Any Year!
Capture the Night.
www.anycosmicnight.com

SKYWATCHER'S INN

THE ARIZONA
ASTRONOMY AND
NATURE RETREAT

BED AND BREAKFAST at the
VEGA-BRAY OBSERVATORY
New, modern, and comfortable lodging.
Many **TELESCOPES** from 6 to 20 inches, computer slewing and **CCD** imaging.
Science museum and planetarium.
DARK SKIES AND SPARKLING DAYS.
47 miles east of Tucson, 28 miles from Tombstone.
Close to many astronomical observatories, historical and natural attractions including Kartchner Caverns.
By appointment only: Tel/fax: (520) 615-3886
c/o 5655 N. Via Umbrosa, Tucson, Arizona 85750
http://www.communiverse.com/skywatcher
E-mail address: vegasky@azstarnet.com

Explore the Heavens & Earth with us in Northern Arizona

- **Largest telescopes (up to 36") for your use in the best dark skies**
- **Days filled with guided geologic tours and more**
- **Expert instruction/ assistance**
- **Comfortable accommodations**
- **Ideal for novice and expert alike**

ASTRONOMICAL ADVENTURES
educational and recreational adventure vacations

2532 North Fourth Street Suite 200
Flagstaff, Arizona 86004
(602) 485-4367
www.AstronomicalAdventures.com

METEORITES

Michael I. Casper, Meteorites, Inc.
Post Office Drawer J
Ithaca, New York 14851 U.S.A.
Phone: 607-257-5349 Fax 607-266-7904
e-mail: casper@meteorites.com
http://www.meteorites.com

new. mexico skies

GUEST OBSERVATORY

☆ ***Spectacular Skies***
DARK Steady Mag 7+ skies
Great Seeing - 7300' elevation
Near: Apache Point & Sunspot

☆ ***Great Equipment***
16"/12" Meade LX 200
14" Celestron / Paramount
7" Astro Physics APO
30"/25"/15" BIG Dobs
Full line SBIG CCD cameras

☆ ***Modern Accommodations***
Full size kitchens/3-2-1 bedrooms

Mike and Lynn Rice, Astronomers
www.nmskies.com
info@nmskies.com
Phone: 505-687-2429/Fax: 505-687-3710
P. O. Box 559, Cloudcroft NM 88317

Bargain Books

Edward R. Hamilton, *Bookseller*
Shop America's *biggest* catalog selection, save up to 80%. **Astronomy**, Science, Computers, Photography, much more. Hundreds of new arrivals monthly.
Free Catalog: 1-800-677-3483
www.erhbooks.com/bgh

EARTH and SKY

UK's leading specialist suppliers of new astronomy books throughout the world
100's of titles available
Tel.fax+44 (0)1328 820083
www.earthandsky.co.uk
sales@earthandsky.co.uk
ask for a free catalogue

SCOPESAVER
BB200 OBSERVING TABLE

The **BB200** is the heart of the ***Scopesaver*** observation station. It fits all ***Meade*** Telescopes that use a standard tripod, including LX200 (7-12"), LX50 (7-10"), 2045D, 2080/2100 (8-10"), all Meade refractors, and some **Celestrons.** The 12x20x1/4" aluminum table is black anodized. Additional accessories available. Amex-M/C-Visa. **Beigle/Bryant Engineering**, P.O. Box 5247 • Pine Mountain Club, CA 93222
800 330-8339 Phone/Fax: (661) 242-5804.

SPACE ART
satisfaction guaranteed

PAINTINGS
PRINTS
POSTERS
CARDS
BOOKS
SCREEN SAVERS

We are the world's only space art gallery, with the largest selection of dazzling visions by the world's finest space artists.
Prompt Friendly Knowledgeable

EXCLUSIVE gallery for paintings from astronaut-artist
ALAN BEAN
limited editions also

Moonwalker
autographed photos
authenticity guaranteed
Flags, patches and artifacts
FLOWN TO THE MOON
authenticated by the Apollo astronauts themselves

NOVASPACE galleries
Box 37197-Q
Tucson, AZ
85740
catalog $3
($5 Int'l)
order online **www.novaspace.com**

The SCT Cooler

kills heat pillars & tube currents - FAST!
Schmidt-Cassegrains and Maksutovs
slashes cool-down time
no scope modifications required

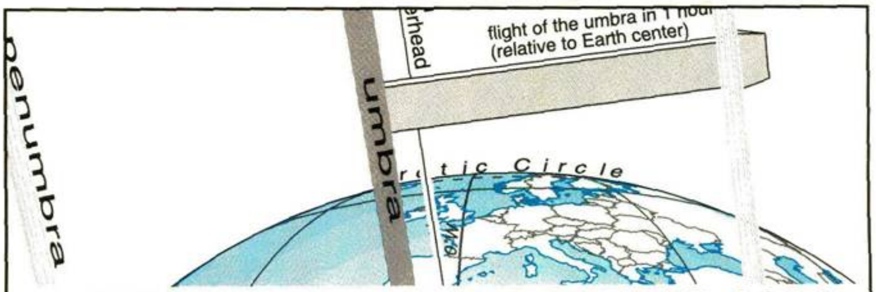
CosmicOne Astronomy Products
(888) 737-5050
Digital Setting Circles
Tripod Stabilizers
Binocular Mounts
Celestron - Meade - TeleVue
Lymax's Earth, Sky, & Astronomy
13008 E. US 40 Hwy, Independence, MO 64055
www.Lymax.com

VIEW THE "OLD UNIVERSE" IN A NEW LIGHT!

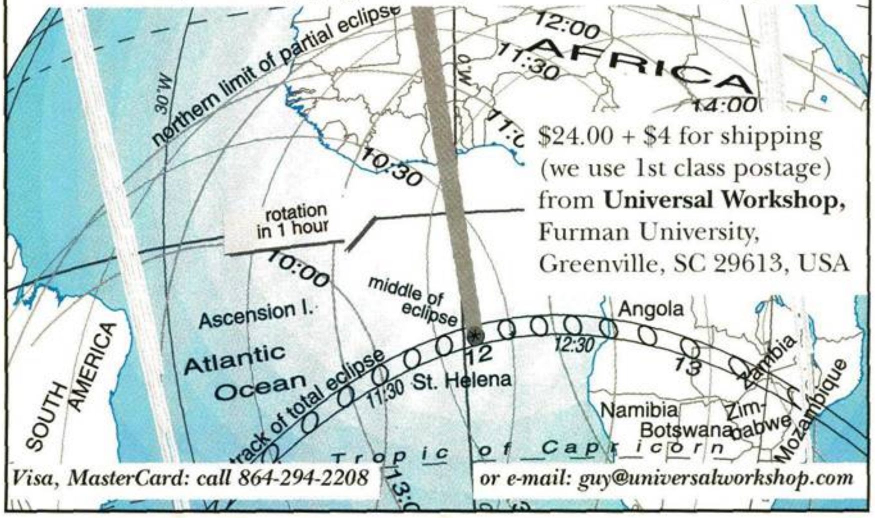
The new ITE "COLOR-EYE" Color Slow-Scan CCD Video Astro-Camera fits any telescope or telephoto lens system. Observe the sun (proper filter required), moon, comets, and planets in real time and in vibrant color at a cost equal to or less than most B&W cameras. Camera is no larger than most 2" eyepieces and is fully self contained (auto shutter, gain and balance). No computer required; connect directly to your VCR, Camcorder, HI-RES monitor or TV. Add an Auto Capture Card to your laptop and capture single frame color images equal to those generated by high-end CCD cameras costing much, much more. Transforms any common telescope into a fantastic group astronomy instrument.

ITE "COLOR-EYE" CCD VIDEO ASTRO-CAMERA....... $ 595 + 15 s&h
MARGI "Capture-to-Go"™ Video Capture Card.................. $ 295 + 10 s&h
(VISA**MASTERCARD**AMEX**DISCOVER ACCEPTED)

ITE/INTERNET TELESCOPE EXCHANGE
3555 Singing Pines Rd., Darby, MT 59829 USA
Ph.: (406) 821-1980 • Email: cescoweb@AOL.com
Website: www.burnettweb.com/ite



ASTRONOMICAL CALENDAR 2001
by Guy Ottewell • 27th edition of this famous guide to all that happens in the sky. 86 huge pages (nearly twice the size of this page)

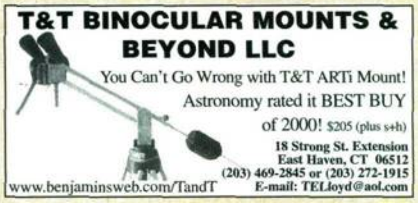


$24.00 + $4 for shipping
(we use 1st class postage)
from **Universal Workshop,**
Furman University,
Greenville, SC 29613, USA

Visa, MasterCard: call 864-294-2208
or e-mail: guy@universalworkshop.com

Astronomy's

Marketplace


T&T BINOCULAR MOUNTS & BEYOND LLC

You Can't Go Wrong with T&T ARTi Mount!
Astronomy rated it BEST BUY
of 2000! $205 (plus s+h)

18 Strong St. Extension
East Haven, CT 06512
(203) 469-2845 or (203) 272-1915
E-mail: TELloyd@aol.com
www.benjaminsweb.com/TandT

8" f/6
10" f/5
12.5" f/5

Take It For A Spin!

Mag1 Instruments Portaball
Quick Set-up • Rotatable Tube
Exceptional Optics

SEE It Spin Online!

mag1instruments.com
262-785-0926

Eclipse
Zambia or Zimbabwe
June 21, 2001

INNOVATIONS IN TRAVEL INC.
1-800-733-3361
E-mail: innovationsintravel@msn.com
Website: innovationsintravel.com

Howie Glatter's
Laser Collimators announces:

A Green (532nm) high visibility laser pointer that's perfect for pointing out celestial objects to groups of people under dark sky conditions.

SkyPointer™
$235+$5 S&H

SkyFinder™
A Green (532nm) laser telescope finder for effortless telescope pointing with "eye-free" convenience under dark sky conditions.

Single Beam Collimators from $100
Holographic Collimators from $150
All Collimators now supplied with accessory small aperture stop.

Major price cut on Ultra-Bright Green Holographic Laser Collimators - Now $350+$5 S&H

Howie Glatter 3850 Sedgwick Ave. Bronx, N.Y. 10463
Tel/Fax (718) 796 3203
www.skypointer.net www.collimator.com
e-mail: howieglatter@mindspring.com

Specialists in Video and CCD imaging
www.astrovid.com

Astrovid 2000
· Easy to use Real-time Video System
· No computer required · Perfect for schools and planetariums · LCD Systems available

CCD Imaging Accessories
· Unique combo flip mirror filter holder
· Large format motorized filter wheel
· Tri-color dichroic and CMY filter sets

Starlight Xpress
· Innovative compact design · Low noise
· High blue sensitivity · Models include unique "one-shot color" CCD

Call us toll free at: 1.888.799.0107
or visit our website at: www.astrovid.com for additional information and for many more unique products.

Adirondack Video Astronomy
26 Graves Street, Glens Falls, NY 12801 USA
Info line +1 518 812 0025 Fax +1 518 745 4114
www.astrovid.com

AVA
adirondackVIDEOastronomy

CELESTRON®
Starlight Xpress Ltd.
Now Carrying
MEADE
ORION
Local Sales Only

- Telescopes, Binoculars, Eyepieces & Accessories.
- Astronomy Books & Supplies.
- Amateur & Shortwave Radio

Radio City
2663 County Road I
Mounds View, MN, 55112
763-786-4475
radiocty@skypoint.com

BUY • SELL • TRADE
800-426-2891
www.radioinc.com

SCOPETRONIX
QUALITY ASTRONOMY PRODUCTS
PHONE/FAX
(941)945-6763

ORIGINAL EQUIPMENT AND AFTERMARKET
ACCESSORIES FOR ETX / NEXSTAR / LX SCOPES

LX50 "Dec Fix Kit" Improves Performance
Low Cost-High Quality Plossl Eyepieces
Joystick for LX200/Magellan II
ETX & NexStar Astro 300 Tripods
Celestar 8 & LX10 Astro 600 Tripod
Universal Digital Camera Adapter
ETX & NexStar Piggyback Mounts
WE ACCEPT: VISA MasterCard American Express Cards
Flexi-Focus™ for the ETX
ETX & NexStar Eyepiece Racks
The "Dew Clip" Dew Heaters
The "Light Sight" Red Dot Finder
ETX & NexStar Photo Tripod Adapters
LX10/50 Deluxe Latitude Adjusters
Tripod Leg Clamps Fits ETX & Others

ScopeTronix Products are also available at these fine Retailers:
Sky Works - Tucson, AZ
Mike's Camera, Inc. - Boulder, CO
Shutan Camera & Video - Chicago, IL
Astronomy World UK Ltd.- Hampshire, England
Oceanside Photo and Telescope (OPT) - Oceanside, CA
Dealer Inquiries Invited!

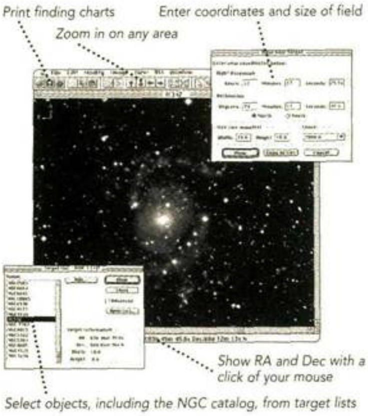
CELESTRON

WE STOCK: CELESTRON, MEADE, JMB, RIGEL, LENSPEN, STARBOUND, ASTELE/LOMO AND MORE!
24 HOUR ONLINE SHOPPING & SECURE ORDERING
WWW.SCOPETRONIX.COM

We Buy
Telescopes, Parts and Accessories
Free Estimates
Hands on Optics
P.O. Box 412 Damascus MD 20872
www.handsonoptics.com
Or ask for our free price list.
301-482-0000

ECLIPSE 2001 ADVENTURES
ALL NEW
AFRICA
MADAGASCAR
Call for **FREE** brochure: 800 830-1998
Journeys for Inquisitive Minds
TravelQuest INTERNATIONAL
570 Skyview Dr., Prescott, Arizona 86303
Visit us: www.tq-international.com

RealSky CD
Use with TheSky, Guide 6.0, MegaStar, SkyMap Pro and Starry Night Pro
"A dream come true."
– Dennis di Cicco, Sky & Telescope


Print finding charts
Enter coordinates and size of field
Zoom in on any area
Show RA and Dec with a click of your mouse
Select objects, including the NGC catalog, from target lists

RealSky CD is a must-have resource for the serious astronomy enthusiast. Angular resolution of 1.7 arcseconds • Unprecedented level of telescopic detail • Stars to 19th magnitude. *North:* to -15° on 8 CD-ROMs. *South:* to the equator on 10 CD-ROMs.
For Windows '95/NT, PowerMac.
New Low Price! Just $200 each or $375 for both!
To order, call 800/335-2624 (415/337-2126 outside U.S.)
Email: catalog@aspsky.org Order Online: **www.aspsky.org**

STARMASTER PORTABLE TELESCOPES
Hi Performance Dobs. Truss Mounted Scopes ranging in sizes from 12.5" F-6 up to 22" F-4.5.
Route 1, Box 780 · Arcadia, KS 66711
or Call: (316) 638-4743
9:00 am - 9:00 pm C.S.T. 7 days a Week.
http://www.icstars.com/starmaster

OPTICAL GUIDANCE SYSTEMS
Custom-Made Ritchey – Chretien, Classical Cassegrain and Newtonian telescopes 10-32 inches. World's #1 selling line of Ritchey - Chretien Optics
OpticalGuidanceSystems.com
2450 Huntingdon Pike, Huntingdon Valley, PA 19006
Ph/Fax: (215) 947-5571

METEORITES

Own a piece of another world!
Free Catalogue and Mailings
New England Meteoritical Services
Box 440-A, Mendon MA 01756 USA
Tel 508-478-4020 Fax 508-478-5104
www.TouchAnotherWorld.com

ROME TELESCOPE CORPORATION
Astronomy Products
Telescopes – Tripods – Accessories
(All Major Credit Cards Accepted)
P.O. Box 0312, Oak Creek, WI 53154
PH# 414-764-6890 www.rometelescope.com

SURPLUS SHED℠
SURPLUS OPTICS AND ELECTRONICS
FREE CURRENT LIST
Phone/fax/faxback TOLL FREE:
1-877-7SURPLUS • 610-926-9226
E-Mail: SURPLUSHED@aol.com
WWW: http://www.SurplusShed.com
407 U.S. Route 222, Blandon, PA 19510

TELESCOPE KITS, LENSES, ACHROMATS MIRRORS, MIRROR BLANKS, ALUMINUM COATINGS & ACCESSORIES
BUY DIRECT ★ DO IT YOURSELF
Stock & Custom mirrors and molded mirror blanks, diagonals, parts made from Pyrex, optical glasses, fused silica, quartz and other low expansion ceramic materials. Telescope accessories, do-it-yourself books.
Write, call, fax or e-mail for catalog
NEWPORT GLASS WORKS, LTD.
P.O. Box 127
Stanton, CA 90680
PH: (714) 484-8100
FAX: (714) 484-8181
E-mail: ngw@netcom.com
Web: http://www.newportglass.com

STAR TEK
FINE ASTRONOMY PRODUCTS
See our '3-in-1' tray and other new products at
www.startekind.com
Toll Free: 888-416-9480
Pat. Pend.

THE WEATHER PICTURE
N
HIGH WIND
24
W
WIND (mph)
12
E
WIND CHILL
64
S
TEMPERATURE
70
HUMIDITY
35
BAROMETER
30.25
RAINFALL
00.18

Put the weather on your wall

The Weather Picture™ is an eye-popping new wall unit that continuously displays all the vital weather data you've pre-selected. Big red numerals are easy to read from across the room, day or night. Available in 2 sizes, in an elegant brushed aluminum or solid oak or teak frame.

Teamed with our famous ***ULTIMETER***® Weather Station, The Weather Picture System provides plenty of data to satisfy the most dedicated weather buff. For complete details, call or write us. Or visit us online to *see and actually try* our ***ULTIMETER*** Systems.

www.peetbros.com
PEET BROS. COMPANY
Dept. AS, 31 E. 17th Street,
St. Cloud FL 34769
Toll free: 866-362-7338

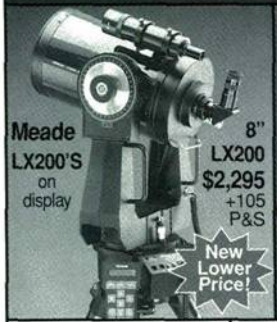
Hardin Optical Company
©

Telescopes, Binoculars, Mounts, Eyepieces and Accessories for the astronomer on your gift list.
Celestron ★ Meade ★ Tele Vue
Astrola Mirrors ★ Bushnell
Brunton ★ Leupold ★ Nikon
Byers ★ Leica ★ Losmandy
and many other quality brands
call 1-877-447-4847 toll free
or visit our online store at
hardinoptical.com

Rivers CAMERA SHOP

"Call for our informative catalog"

AUTHORIZED MEADE® APD MAIL-ORDER DEALER


Meade
LX200'S
on display
8"
LX200
$2,295
+105 P&S
New Lower Price!

Meade
DS-127EC
$499.95
+30 P&S

Meade ETX-125/EC
$895.00
+30 P&S
in stock!

ETX Accessories
#126 2x Barlow $47.95
#64 Camera Adapter $34.95
ETX Tripod $199.95

Most Meade Products In Stock/On Display!
- Meade Starfinder
- Dobsonians & Equatorials
- ETX 60 + 70 AT
- DS70, DS80, DS90, DS114, DS127
- Meade Series 3000 and 4000 Eyepieces
- Most other Meade accessories in stock

AUTHORIZED CELESTRON® DEALER

NEW Nexstar 5
in stock
$1199.95
+20 P&S

New CELESTRON®
Nexstar 8 inch
Including Tripod
$1699.95
+30 P&S

Most Celestron Products In Stock!
- Celestron Star Hopper Dobsonians
- Celestar 8 SCT's
- LED flash lights
- Ultima Series Eyepieces
- First Scope 60's, 70's, 80's & 114's in stock
- Accessories in stock

Collins Image Intensifier
In stock
See what you have been missing!

New Location!
179 Water Street
Exeter, NH
(603) 778-1990

Why Buy From Us?
- NE's Largest Telescope Display
- Mail-Order or In-Store. No Sales Tax!
- Used Scopes-Buy, Sell or Trade-In
- Knowledgeable, Helpful, Friendly Staff

TeleVue®

Rivers CAMERA SHOP
454 Central Ave.
Dover, NH 03820
Phone: (800) 245-7963 • Fax: (603) 742-5456
Hours: M-TH 8:30-6:00, Fri. 8:30-8:00, Sat. 8:30-5:30
www.riverscamera.com

ASTROPTX

"Our scope is worldwide."
We sell all major brands!

Celestron ★ Meade ★ B&L
Telescopes-Binoculars-Accessories

LOWEST PRICES

Tel: (860) 355-3132

Phone Orders
9am to 9pm (7) Days
Fax: (203) 746-3579 (24) Hrs
57 North Street #401
Danbury, CT 06810
Huge Discount Catalog
5,000 Items
$10 (refundable)

DISCOVER MasterCard VISA

E-MAIL: ASTROPTX@ASTROPTX.COM
WWW.ASTROPTX.COM

LensPen - When you're ready to play with the big boys.

The superior lens cleaning system for all fine optics.
a LensPen Distributor

We're not sure what the National Solar Observatory uses, but LensPen is the best lens cleaning system for all your binoculars, telescopes, and camera lenses.

LENSPEN®
miniPRO®

Toll free:
1-877-608-0868
Parkside Optical Inc., Vancouver, BC Canada

www.lenspen.com

CELESTRON® A LensPen Distributor

Visit The Astronomy Shoppe
(at our store, online, or over the phone)

The Astronomy Shoppe
TELESCOPES
MEADE
CELESTRON

You'll be talking to an amateur astronomer when you do. We carry such brands as Meade, Celestron, Orion, TeleVue, and Takahashi. We also carry a full range of accessories including eyepieces, photo adapters, mounts, binoculars, spotting scopes, and a whole lot more.

The Astronomy Shoppe
www.darkskyinc.com
1-888-999-6396 (Toll Free)
1-602-971-3170 (Arizona)
3202 E. Greenway, #1615,
Phoenix, AZ 85032
E-mail: astroshop@earthlink.net
MasterCard and Visa Accepted

10 x 7 – $1795
10 x 8.5 – $1995

It will change the way you look at the stars

Sky Tent®

- Simple 1-person setup–25 min, no tools
- Highly UV resistant
- Dome rotates 360° on stationary base
- Stable in 60mph+ wind
- Weighs 100 lbs, packs easily in car
- Blocks local light pollution
- Eliminates wind vibration & chill
- Withstands heavy rain & snow
- Several sizes, from $1795
- Portable or permanent installation

www.skytent.com TOLL FREE **1-877-SkyTent**

Starsplitter Telescopes
Quality Focused on the Customer!

Starsplitter II
15"- 40"
Compacts
8"-15"

We offer the largest selection of Newtonian telescopes on the market today!

Please send $2.00 for a catalog. Online catalog at www.starsplitter.com

Starsplitter Tube
6"-10"
APO - Eater
6" f/10 & 8" f/8

Starsplitter Telescopes
3228 Rikkard Drive
Thousand Oaks, CA 91362
805-492-0489 Phone & Fax
www.starsplitter.com

TUTHILL

Your Astronomical Friend Has Urgent Advice for Serious Eclipse Chasers At:

www.tuthillscopes.com

NEW
ROBO-DOME™

50" tall ROBO-DOME, with Thanh

- All-robotic observatory
- Big enough for a telescope, but not a person
- Fully Assembled
- All Fiberglass
- Very Affordable: $3200

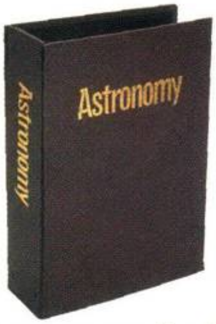
Visit our Web Site!
We manufacture 6, 10 and 15 ft. HOME-DOME & PRO-DOME OBSERVATORIES.

Technical Innovations, Inc.
22500 Old Hundred Rd.
Barnesville, MD 20838
Ph: 301-972-8040
Fax: 301-349-2441
www.homedome.com

FREE Brochure

PROTECT YOUR INVESTMENT!

Preserve your library of *ASTRONOMY* Magazines with durable hardcover binders.



Order yours today!

call 800-533-6644

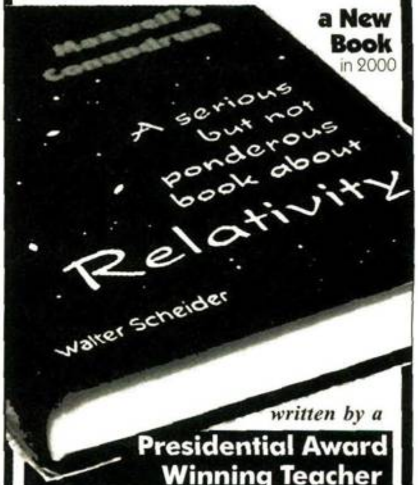
www.kalmbachbooks.com
Secure online ordering available.

Astronomy®

5274-0009 AFIL

This year
Give the Gift of new Insight

a New Book in 2000



written by a
Presidential Award Winning Teacher

for the intelligent non-specialist

- **"clear and engaging style"**
- **"Highly recommended"**

-- ALA's CHOICE Magazine, Sept 2000

Cloth $22.95 Paper $14.95 1-800-247-6553
Cavendish Press POBox 2588 Ann Arbor MI 48106
www.cavendishscience.org

Over 12,000 Product Descriptions Online!

Order Online @
# www.focuscamera.com

TOLL FREE FAX
800-TO-FOCUS
OVERSEAS FAX
718-437-8811

4419-21 13TH AVE.
BROOKLYN, N.Y. 11219
888-221-0828

N.Y. STATE & OVERSEAS
718-437-8810
E-MAIL ADDRESS
orders@focuscamera.com

MEADE
ADVANCED PRODUCTS

MAKSUTOV-CASSEGRAINS

ETX SCOPES

Exquisite, Diffraction-Limited Imaging in an advanced, ultra portable telescope system!

ETX-90EC Includes:
w/Dual-Axis Drive,
8x21 Erect-Image Viewfinder
& 26mm Plossl

ETX- 125EC Includes:
Dual-Axis Drive,
8x25 Right-Angle Viewfinder
& 26mm Plossl

Optional #497 Autostar controller with GO TO capability **$149**

ETX 90EC 1250mm f/13.8	$595
ETX 125EC 1900mm f/15	$895
LX-50 7" f/15 w/Std Equatorial Wedge	$1,795
LX-200 7" f/15 w/Heavy Duty Fork Mount	$2,795
#883 Deluxe ETX Field Tripod (90/125)	*199.00*
#64 Photo Adapter (90/125)	34.95
#825 8x25 Right-Angle Viewfinder (90)	49.95
#880 Equatorial Table Tripod (90)	29.95
#881 *Equatorial Table Tripod (125)*	59.95
#932 45° Erecting Prism (90/125)	49.95
#1244 Electric Focuser (90)	119.95
#1247 Electric Focuser (125)	119.95
#774/#775 Hard Case for ETX	CALL

PICTOR CCD IMAGERS
416-XTE & 1616-XTE

With New Kodak Blue-sensitive CCD Chip

For the beginner, or for the most advanced observer, the real CCD revolution is here!

201-XT Autoguider/Imager	395
208-XT Autoguider/Imager	495
216-XT Autoguider/Imager	695
416-XTE Autoguider/Imager	1,995
1616-XTE Autoguider/Imager	6,495
Off Axis Guider f/CCD	89.95
616 Color Filter System f/416, 1616-XT	695
616A Color Filter System f/216	695
520 Electronic Relay f/201, 208, 216, 416, 1616	94.95
541 AC Adapter f/201, 208, 216	36.95
542 AC Adapter f/416, 1616	94.95

EYEPIECES

MODIFIED APOCHROMATIC

9, 12, 25, 40mm 1.25"	37.95	9, 12, 25, 40mm .96"	29.95

PLOSSL SERIES 3000

5, 6.7, 9.5, 16, 25mm 1.25"	49.95	40mm 1.25"	79.95

SUPER PLOSSL SERIES 4000

6.4, 9.7, 12.4, 15, 20, 26mm 1.25"			79.95
32, 40mm 1.25"	99.95	56mm 2"	199.95

PLOSSL SERIES 4000 SUPER WIDE ANGLE

13.8mm 1.25"	139.95	18mm 1.25"	149.95
24.5mm 1.25"	179.95	40mm 2"	299.95
32mm 2"	239.95		

PLOSSL SERIES 4000 ULTRA WIDE ANGLE

4.7mm 1.25"	169.95	8.8mm 1.25"/2"	239.95
6.7mm *1.25"*	*199.95*	14mm *1.25"/2"*	299.95

ILLUMINATED RETICLE EYEPIECE SYSTEMS

	Wireless	w/Cord
Plossl 9mm 1.25"	149.95	129.95
MA 12mm 1.25"	99.95	79.95
MA *12mm Astrometric* 1.25"		119.95
Plossl 25mm CCD Framing Ocular 1.25"		129.95

BARLOWS

#122 2x Telenegative 1.25"	44.95
#126 2x Short Focus 1.25"	44.95
#127 2x-3x Variable 1.25"	56.95
#134 Achromatic .96"	44.95
#140 2x Apochromatic 1.25"	74.95

SCHMIDT-CASSEGRAINS

In virtually every country in the world where serious telescopes are sold, more Meade LX-200's are sold than all competing models combined.

Standard-equipment includes:
- Superb optics
- Automatic GO TO capability
- LX-200 High-Precision Pointing
- Permanently-Programmable Smart Drive
- 9-Speed Dual-Axis Electronics
- Field operation

LX-10 8" w/Hand Controller	$995
LX-50 8" f/10	$1,395
LX-50 10" f/10	$1,695
LX-50 10" f/10 w/Super Wedge	$1,895
LXD 300 SERIES 203 8" f/10	$795
LXD 500 SERIES 203 8" f/10	$895
LX-200 8"	$2,295
LX-200 10"	$2,695
LX-200 12"	$3,995
LX-200 16"	CALL
LX-200SC 12" f/2.2 Schmidt-Camera	CALL
Magellan I #2014 f/LX-10	375
Magellan II #2024 f/LX-50	495

ED APO REFRACTORS

300 SERIES

102 Achromatic 4" f/9	$595

500 SERIES

102 Apochromatic 4" f/9	$1,649
102 Achromatic 4" f/9	$695
102ED 4" f/9 w/Mount, Tripod & Acc.	$2,795
127ED 5" f/9 w/Mount, Tripod & Acc.	$3,295
152ED 6" f/9 w/Mount, Tripod & Acc.	$4,995
178ED 7" f/9 w/Mount, Tripod & Acc.	$5,995

Optical Tube Only	CALL
#1207 Electric Focuser	144.95
#1664 Electronic Drive	349
#1697 Computer Drive System	749
#1702 Dual Axis Drive System	195
#1812 Electronic DC Adapter	89.95

ACCESSORIES

#62 T-Adapter f/SCT	26.95	Off Axis Guider	79.95
#931 45° Hybrid Erct Prsm	43	f/6.3 Focal Reducer	129.95
Basic Tele-Extender	29.95	**#1205** Focuser	CALL
Camera Adapter 1.25"	29.95	**#1206** Focuser	CALL
Camera Adapter .96"	27.95	6x30 Viewfinder	CALL
Variable Tele-Extender	39.95	8x50 Viewfinder	CALL
DEW SHIELD & DUST COVER	Call	**#607** 25' Cigarette Adpt	25
Piggyback Bracket f/SCT	Call	55 Manual DEC Control	75

Variable Projection Camera Adapter 1.25"	39.95
#927 45° Erect Image Diagonal Prism .96"	42.95
#928 45° Erect Image Diagonal Prism 1.25"	42.95
#929, #930 2" Mirror Diag. w/Eyepiece Holder f/1.25"	99.95
Tube Balance Weight System f/All SCT	CALL
#531 *Motor Drive w/Auto Tracking f/4500 Newtonian*	CALL
Interface Cable f/LX-200	25
EPOCH 2000sk Sky Software 3.5" Disks	149
EPOCH 2000sk Sky Software CD	179
EPOCH 2000ip Software 3.5" Disks	199

FILTERS

#905 Variable Polarizer 1.25"			49.95
Moon Filter ND96 1.25"	16.95	4 Piece Set 1.25"	49.95
Individual Filters	14.95	Skylight/Dust Seal	44.95

* Nebular	Oxygen III	Broadband*	Narroband*
#908 1.25"	99.95	79.95	89.95
#910 2"	159.95	119.95	129.95
#911 Rear Cell	149.95	99.95	119.95

STARFINDERS

Dobsonian Deluxe Package Add $49.95

SPECIAL EYEPIECE OFFER!
At time you order any Meade Equatorial, get a 9.7mm Series 4000 Plossl **for only $29.95!**

	Dobsonian	Equatorial
6" f/8 w/26mm Plossl	$349.95	$649.95
8" f/6 w/26mm Plossl	$449.95	$749.95
10" f/4.5 w/26mm Plossl	$599.95	$879.95
12" f/4.8 w/26mm Plossl	$895.95	-
16" f/4.5 w/26mm Plossl	$1,195	$2,695

Magellan I #2010 f/Dobsonians	295
Magellan I #2011 f/Equatorial 6", 8", 10"	295
Magellan I #2012 f/Equatorial 16"	295
Magellan II #2018 f/Equatorial 6", 8", 10"	495
Magellan II #2019 f/Equatorial 16"	595

DIGITAL ELECTRONIC SERIES

The Most Important Advancement in Begining and Intermediate Telescopes in 100 Years!

- Object tracking
- Altazimuth mountings
- Electronic controller (EC)
- Autostar computer controller
- Meade StarNavigator software

ACHROMATIC REFRACTORS

DS-60 60mm (2.4"), 700mm f/11.8	$199
DS-70 70mm (2.8"), 700mm f/10	$249
DS-80EC 80mm (3.1"), 900mm f/11.3	$449
DS-90EC 90mm (3.5"), 1000mm f/11.1	$499

NEWTONIAN REFLECTORS

DS-114EC 114mm (4.5"), 910mm f/8	$399
DS-127EC 127mm (5"), 1020mm f/8	$499
Optional Autostar Controller	$99.95

SPECIALS!

MEADE

390 3.5" 90mm, 1000mm f/11	$229.95
MTS-SN6 Telescope	CALL

CELESTRON

25mm Ocular 1.25" (93307)	$19.95
19mm Ultima WA 1.25" (93358)	$79.95
GP-C8 (Demo) #91514-GP	CALL
ULTIMA 9 1/4 9 1/4"	$2,199
C5+ 5", 1250mm f/10	$899
PixCel CCD Camera	$895.95
Fastar 8 2032mm (8") f/10	$2,089.95
Ultima 11 2800mm (11") f/10	$2,749
500mm Mirror Lens #81005	$239.95

BINOCULARS & SPOTTING SCOPES

CELESTRON

BLOWOUT!

8-32x50 Zoom $114.95

9x63 Ultima	CALL	*20x80 Giant*	368.95
8x32 Ultima	188.95	10x50 Regal	CALL
8x56 Ultima	268.95	8x40 Pro	114.95

MEADE

8x25 Safari Pro	180	10x25 Safari Pro	200
7x36 WA Safari Pro	170	8x42 WA Safari Pro	180
10x42 Safari Pro	190	10x50 WA Safari Pro	200
7x42 WA Rainforest Pro	480	8x56 Rainforest Pro	500

Nikon. SPORT OPTICS

You'll Never See Things Quite The Same Again!

7x35 E **245** 8x30 E	257	10x70	1048.95
8x32 E Superior	CALL	*7x50 Prostar*	721.95
10x42 E Superior	CALL	10x40 Lookout IV	102.50
12x50 E Superior	CALL	10-22x50 Scoutmaster XL	135

SPOTTING SCOPES

Fieldscope (60mm)			347.95
Fieldscope 60 ED II	574.95	*60 ED II Angled*	634.95
Fieldscope 78 ED	1229.99	78 ED Angled	1299.99

Leica SPOTTING SCOPES
APO TELEVID 77mm
Ask About Leica's Passport Protection

Kowa

77MM SERIES SPOTTING SCOPES

TSN-2	379.95	TSN-3	799.95

TSN-4 ..... **$649.95**

82MM SERIES WATERPROOF SPOTTING SCOPES

TSN-821 Angled	CALL
TSN-822 Straight	364.95
TSN-823 Angled	814.95
TSN-824 Straight	CALL

Check Out Our Special Package Pricing on 820 Series Spotting scopes
Package includes: Scope, 20-60x, Case & Tripod.

ZEISS

Special! 15x60	$1,849
20x60 Image Stabilizer	CALL
Spotting Scopes	CALL

Canon

IMAGE STABILIZERS
10x30 • 12x36 • 15x45
15x50 AW • 18x50 AW
$50 Rebate!

FUJINON

SPECIAL! 7x50 FMTRC-SX w/Compass			499.95
8x30 FMT-RSX	CALL	10x70 FMT-SX w/Case	CALL
7x50 FMT-SX w/Case	CALL	16x70 FMT-SX w/Case	CALL
Super 80 Scopes w/Zoom & Case			CALL

C90 Multicoated Spotter Outfit

With Free T-Mount!

$299.95

#81013

CELESTRON

BAUSCH & LOMB BUSHNELL

SPOTTING SCOPES

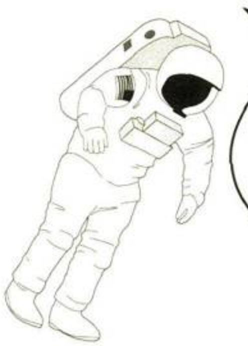
Discoverer 15-60x			176.95
Discoverer T-Mount	11.95	Camera Adapter	13.95
Spacemaster	149.95	Kit	247.95
Spacemaster Armored	163.95	Kit	259.95
Spacemaster Zoom Black Armored			226.95

All Kits Include: 15-45x Eyepiece & Case or Pouch

SWAROVSKI OPTIK

SPOTTING SCOPES
AT-80 • *ST-80*
AT-80 HD Angled
ST-80 HD Straight

Focus Camera, Inc., 4419-21 13th Ave., Brooklyn, NY 11219 ALL ORDERS ARE SUBJECT TO AVAILABILITY AND VERIFICATION. ORDERS ONLY CALL 888-221-0828 • INFORMATION & NY STATE CALL (718)437-8810 **Orders** ORDER STATUS & CUSTOMER SERVICE (718) 437-8899 • 24-HOUR FAX LINE (877) 863-6288 • STORE INQUIRIES (718) 436-6262. Shipped Promptly - Most Major Credit cards, Money orders & personal checks accepted for payment. COD orders are accepted but may require a deposit, personal checks may require up to 14 days to clear. All orders are subject to verification & acceptance. Shipping, handling & insurance are additional,please call/write for exact details. 14-day money-back guarantee (less shipping) provided merchandise is returned in new condition,



America's
Largest Stocking
Authorized Astronomy
Dealer!

We Ship Promptly!

888-221-0828

N.Y. STATE & OVERSEAS
718-437-8810
E-MAIL ADDRESS
orders@focuscamera.com
Order on The Web at:
www.focuscamera.com

CELESTRON

SCHMIDT-CASSEGRAINS

NEW! NexStar 8

There is no substitute for size. With Celestron's legendary 8" optics, now you can see deeper into space with the same ease as with the innovative NexStar 5. Images in the NexStar 8 are over two times brighter than with a 5" telescope.

With the touch of a button, the NexStar 8 will open door to planets, galaxies and nebulae that you have never experienced in your lifetime. Exquisite design, pinpoint computer control and stability come together in one dynamic package.

NexStar 8 8", 2032mm f/10 ***NEW!***	$1,899
NexStar 5 5", 1250mm f/10 ***NEW!***	$1,199
NexStar Tripod	$175
G-3 3.5", 1000mm f/11	$499
G-5 5", 1250mm f/10	$699
G-8 8", 2032mm f/10	$999
G 9 1/4 9 1/4", 2350mm f/10	$1,299
CM-1100 11", 2800mm f/10	$3,199

REFRACTORS

Firstscope 80 Series
80mm (3.1")
3 Models Avail.

Firstscope 70 Series
70mm (2.8")
3 Models Avail.

Firstscope 60 Series
60mm (2.4")
4 Models Avail.

Firstscope 60	$109
Firstscope 60 Equatorial	$159
Firstscope 80 Equatorial	$349

C80-HD 80mm (3.1"), 900mm f/11	$399
C102-AZ 102mm (4"), 1000mm f/10	$399
C102-HD 102mm (4"), 1000mm f/10	$499
CR-150-HD 150mm (6"), 1200mm f/8	NEW!

NEWTONIANS

Firstscope 76 Equatorial 76mm (3")	$159
Firstscope 114 Series 114mm (4.5") 4 Models Avail.	
Firstscope 114 Dlx w/Wood Tripod	$299
Firstscope 114 Premium w/Alluminum Tripod	$349
C114-HD 114mm (4.5"), 900mm f/8	$399
C150-HD 150mm (6"), 1000mm f/7	$499

STAR HOPPER DOBSONIANS

4.5" ... $239 6" ... $399 8" ... $499

EYEPIECES & VIEWING ACCESSORIES

Diagonal, Prism Star	**39.95**	Diagonal, Mirror 2"	**129.95**
Diagonal, Erect Image 45			**39.95**
Diagonal, Erect Image 90			**49.95**
Plossl 1.25" 32, 40mm	**49.95**	Tele-Extender Dlx	**48.95**
Plossl 1.25" 6.3, 7.5, 10, 12.5, 17, 20, 26mm			**39.95**
Ultima 1.25" 5, 7.5, 12.5, 18mm			**74.95**
Ultima 1.25" 24, 30, 42mm			**94.95**
Ultima 1.25" 35			**99.95**
LV Series 1.25" 5, 6, 9, 10, 15mm			**94.95**
LV Series 1.25" 2.5, 4, 12, 20, 25mm			**109.95**
LV Series 1.25" 8-24mm Zoom			**159.95**

BARLOWS

2x 1.25"	**39.95**	2x .96"	**19.95**
2x 1.25 Ultima	**62.95**	2x .96" Dlx	**44.95**

FILTERS

4 Piece Filter Sets	**49.95**	Skylight Filter	**44.95**
Moon Filter 1.25"	**16.95**	Solar Filters	**CALL**
LPR Filter Model A 1.25"			**59.95**
LPR Filter Model B f/Back Threads of SC's			**84.95**
Polarizing Filter Set 1.25"			**42.95**

SCHMIDT-CASSEGRAINS

CELESTAR 8 COMPUTERIZED

Engineered for unsurpassed optical performance in an affordable, full featured Schmidt-Cassergrain telescope of large enough aperture to do serious deep-sky observing. This telescope is carefully crafted and manufactured in the USA for dependable quality of the highest caliber. It offers the lowest price ever for a Celestron fork mounted 8" telescope.

CELESTAR 8 8", 2032mm f/10	$1,099
CELESTAR 8 Computerized	$1,599
CELESTAR 8 Deluxe	$1,699
CELESTAR 8 DLX Computerized	$2,199
ULTIMA 2000 8" 2032mm f/10 2032mm f/10 w/Go To System	$2,699
CM-1400 14", 3910mm f/11	$5,299

SPOTTING SCOPES

C5 Spotter

- Fully multicoated optics
- Excellent light gathering ability
- Standard 8x20 erect image finderscope
- Near focus of 20'
- 45° erect image diagonal & 26mm Plossl 48x eyepiece – both 1.25"
- 22mm eye relief and 1° field of view with standard eyepiece
- Fitted with convenient tripod adapter block

C5 Spotter	$599
80mm Wide View	$199
50mm Zoom	$99
60mm Zoom	$69
30mm Mini Spotter	$49

TRIPODS & MOUNTS

Heavy Duty Tripod (93499)	284.95
Photographic Tripod (93596)	99.95
Standard 8" Wedge (93656)	92.95
Heavy Duty Wedge (93655)	239.95
Upgrade Kit f/93655	109.95
Equatorial Mount CG-3	144.95
Equatorial Mount CG-5	369.95
CI-700 Mount	1,859.95
Vibration Supression Pads	39.95

ACCESSORIES

AC Adapter	**18.95**	Lens Shades	**CALL**
Focus Motor	**114.95**	Motor Drives	**CALL**
Car Battery Adapter	**18.95**	T-Adapter f/C90	**28.50**
Radial Guider	**97.95**	T-Adapter f/SCT's	**24.95**
Case f/C5 & C8 (Most Models)			**209.95**
Counterweight Bar Assembly 8"			**89.95**
Counterweight Bar Assembly 11"			**94.95**
DEC Motor f/C5+, Celestar 8, Ultima 9 1/4/11			**CALL**
Digital Setting Circles			**299.95**
Flashlight Red Astro Lite			**9.95**
Flashlight, Night Vision			**21.95**
Focus Micrometer, Digital			**109.95**
Hand Controller f/C5+, Celestar 8			**49.95**
Piggyback Mount 8"			**34.95**
Reducer/Corrector f/6.3			**111.95**

FINDERSCOPES

5x24	**23.50**	7x50 w/Illuminator	**159.95**
6x30	**39.95**	9x50	**44.95**

---

unused as received with papers & packaging intact. We gladly accept and reply to written or faxed inquiries. Ad prices available while supplies last. This ad supersedes all previous ads. Focus camera is not responsible for typographical errors. Hours: Mon.-Thurs. 9-7, Fri. 9-2, Sun. 10-6.

TeleVue
Visionary

Renaissance-101

101mm (4"), 540mm f/5.4
Available in Green or Ivory

IN STOCK!

TV-85

85mm, 600mm f/7
Available in Green or Ivory

IN STOCK!

Pronto™

70mm ED, 480mm f/6.8
Available in Ivory or Green

w/1.25" 45° Erect Prism (PGA/PIA)	$925
w/1.25" Star Diagonal (PGO/PIO)	$945
w/2" Star Diagonal (PGD/PID)	$1,085

Ranger

70mm ED, 480mm f/6.8
Available in Ivory, Green or Brass

w/1.25" 45° Erect Prism (RGA/RIA)	$685
w/1.25" Star Diagonal (RGO/RIO)	$695

Ranger Power Package

Includes: 90° Star Diagonal, 20-60x Zoom, 2.5x Powermate & Shoulder Bag (RPP2500)	$1,030

MOUNTS

TELE-POD MOUNT SYSTEM Complete 7lbs Mounting System Ideal for Traveling	$325
Ash Panoramic Mount	$455
Ash Gibraltar Mount	$530
Ash Gibraltar w/Sky Tour	$1,210
Up-Swing Head	$110

EYEPIECES

ZOOM EYEPICE 8mm-24mm ... $210

PLOSSL (50°)		**PANOPTIC (68°)**	
8, 11mm 1.25"	**82**	15mm 1.25"	**210**
15mm 1.25"	**82**	19mm 1.25"	**240**
20, 25mm 1.25"	**95**	22mm 2"/1.25"	**280**
32mm 1.25"	**110**	27mm 2"	**330**
40mm 1.25"	**110**	35mm 2"	**365**
55mm 2"	**228**	Barlow Interface	**90**
RADIAN (60°)		**NAGLER (82°)**	
3, 4mm 1.25"	**228**	4.8mm 1.25"	**175**
5, 6mm 1.25"	**228**	7mm 1.25"	**220**
8mm 1.25	**228**	9mm 2"/1.25"	**240**
10mm 1.25"	**228**	**NAGLER Type 2 (82°)**	
12mm 1.25"	**228**	16mm 2"/1.25"	**310**
14mm 1.25"	**228**	**NAGLER Type 4 (82°)**	
18mm 1.25"	**228**	12mm 2"/1.25"	**340**
NAGLER Type 5 (82°)		17mm 2"	**370**
31mm 2"	**595**	22mm 2"	**445**
BARLOWS			
2x 1.25"	**105**	2.5x Powermate	**168**
2x Big 2"	**168**	4x Powermate	**265**
3x 1.25"	**105**	5x Powermate	**168**

ACCESSORIES

RICH FIELD KIT Includes: 55mm Plossl, 2" Star Diagonal, SCT to 2" E.P. Adptr & 2" to 1.25" E.P. Adptr	**410**
RICH FIELD PREMIUM KIT w/Everbright 2" Star Diag	**480**
Bino Vue Binocular Viewer	**1,030**
Paracorr Photo/Visual 2" Coma Corrector	**235**
NEW! *Everbright 2" Star Diagonal Mirror*	**255**
2" Enhanced Star Diagonal	**190**
1.25" Star Diagonal	**75**
1.25" Prism 45°	**60**
Air Chair	**150**
Basic Qwik Point (QPU)	**19.95**
Starbeam Projection Finder	**180**
Camera Adapter 1.25" & 2"	**36**
Piggy-Cam Camera Adapter	**42**

TELRAD

Finder Scope ... $36.49

ASTRONOMY BOOKS

The Deep Sky: An Introduction

By Philip S. Harrington Here is the perfect reference for anyone, who owns a telescope or a pair of binoculars but doesn't know what to look for amid the constellations. It explains how to find double and multiple stars, variable stars, open and gobular clusters, nebulae, and galaxies — what you'll see when you do. Includes 36 full-page sky charts, equipment, books, and software suggestions, sketches of how deep-sky objects look through a small telescope, and more than 100 black & white photographs. 272 pages.

The Deep Sky: An Introduction	**24.95**
Backyard Astronomer's Guide	**39.95**
Nightwatch: A Practical Guide to Viewing the Universe, 3rd Edition	**29.95**
Star-Hopping for Backyard Astronomers	**19.95**
Celestron Sky Map	**16.95**
Meade Star Chart	**16.95**

Sky Altas 2000

Deluxe Edition			**49.95**
Desk Edition	**27.95**	Field Edition	**27.95**
Laminated Deluxe Edition			**99.95**
Laminated Desk Edition			**59.95**
Laminated Field Edition			**59.95**

JMI
JIM'S MOBILE INC.

Next Generation Computers
Motofocus • NGF Focuser
Wheely Bars • Motodec

THOUSAND OAKS

Precision Glass Solar Filters
Mounted Type 2
Mounted Type 2 Plus
Mounted Type 3 Plus

ASTRONOMY SOFTWARE

RedShift 3	
CD f/Windows	$44.95
CD f/Macintosh	$44.95
The Sky	
Level IV, Ver. 5 CD f/Windows	$239.95
Skymap Pro 6.0	
CD f/Windows	$89.95
SkyChart III CD	$38.95

Take advantage of our LARGE INVENTORY! Immediate shipment from stock!

Anyone can sell you a telescope.

Authorized Meade Dealer

Meade ETX-90EC
$595
Meade ETX-125EC
$895
#497 Autostar
$149

Hardly a day goes by that we don't get a note or E-mail message like the one reprinted on the next page, or a call that goes something like this: "Your ads are right. Dealer so and so advertises low prices – but they don't have what I want in stock, they couldn't answer *any* of my questions, and they wanted my credit card number before they'd even *talk* to me. They said if I wanted to ask questions, I should call the manufacturer . . . and then they hung up on me!"

If you want the right telescope, you need more than a camera store clerk armed with only a price list and not a clue in the world about astronomy.

What you *really* need are people who will take the time to listen to what *you* need, people who can can answer your questions, people with years of experience using and selling telescopes who can help you get the most telescope for your dollar. That's exactly the kind of people you'll find at ***astronomics***.

Unlike camera stores and shopping mall gift shops, telescopes are our specialty at ***astronomics***, not just a sideline. We're a family-owned full-line telescope dealer – not just a few toy telescopes stuck off in the corner of some no-help department store, toy store, or gift shop as an afterthought. And, unlike department store clerks, we don't work on commission, so we won't try to sell you more than you need just to pad our paychecks.

We've been helping people choose the right telescope since 1979. We have the experience to help *you* pick the scope that fits your needs . . . *and your budget* . . . from the many Meade, Celestron, TeleVue, Takahashi, and Questar telescopes we keep in stock at discount prices from $99 to $27,995.

And we can usually ship your right telescope right away. We had over 800 scopes *in stock* as we wrote this on 9/5, and an additional 1000+ on order.

astronomics. No hard sell. No guesswork. Just honest advice, the *right* scope, and a good price. Call us at (405) 364-0858 and find out for yourself.

We buy telescopes by the ton . . . literally!

The day before this copy was written, we received 305 cartons from Meade – *3¼ tons* of scopes and accessories in one shipment. Earlier in the same week, we received 9791 pounds of Celestron scopes and accessories in a single shipment – 21 pallets, a full trailer load. We don't know of many dealers – if any – who regularly stock Celestron and Meade products in those quantities . . . *no matter what they claim*. But we do. Telescopes, eyepieces, filters, CCD cameras and autoguiders, dew caps, Barlows, off-axis guiders, illuminated reticle eyepieces, electric focusers, T-adapters, tele-extenders, counterweights – we keep them all in stock.

Buying in such large quantities allows us to take advantage of special buys – extra savings that we pass on to you.

A new low price on the Celestron NexStar 8 . . . and we ship for free!

Here's a deal that doesn't come along very often – a $200 price cut on a popular go-to telescope, *and* free shipping within the 48 continental United States! The sleek Celestron NexStar 8 is powered by AA batteries, so it's portable indeed. It has 8" f/10 Starbright multicoated optics, a go-to computer with an 18,000+ star and object database, eyeglass friendly long eye relief Star Pointer non-magnifying finder, a 40mm NexStar Plössl eyepiece, an AC adapter, a tripod, and more.

Free shipping, a $200 savings, and best of all . . . it's in stock!

Celestron NexStar 8
$1699

The new 8" Meade LX90 lowers the cost of living it up!

Meade 8" LX90
$1695

You can live the good life of big-aperture fully computerized go-to astronomy for less money than ever before with the new 8" **Meade LX90**.

The 8" LX90 SCT is only $1695, including a tripod and a go-to Autostar computer with 30,223 stars and objects in its data base. Since we have over a hundred LX90 scopes in stock and in transit, the chances are good that you can get one this holiday season with little or no delay. While backorders *are* possible on this new model, if Meade is shipping the LX90 for a dealer to keep in stock, chances are good we *have* it in stock.

Meade prices are about the same anywhere you call. So why order a Meade telescope or accessory from a dealer who charges your credit card, then makes you wait and wait until he finally gets around to ordering what you want? Not when you can usually get the Meade you want . . . right now . . . at the right price . . . right here at ***astronomics.***

We have the Meade ETX-125EC in stock!

Meade 5" ETX-125EC
$895

We have over 100 **ETX-125EC** 5" Maksutov-Cassegrains in stock, with more scheduled for delivery. There are plenty available for last minute holiday gift giving.

We've sold nearly 500 of these 5" computerized Meades during past year, and 250 of its smaller brother, the 3.5" ETX-90EC. Add the new 60mm and 70mm ETX refractors, and the Meade ETX scopes make up the most popular family of go-to scopes we carry.

And we don't just have ETX scopes in stock. We have Autostar computers, cases, tripods, eyepieces, electric focusers, filters, camera adapters, and more. If it's any of the Meade ETX scopes, or an accessory for a Meade ETX – *or any Meade telescope* – chances are good that we have it in stock.

Super second scopes.

Left, Meade ETX-60AT, **$299**; *above*, Meade ETX-70AT, **$349**

The new 60mm **Meade ETX-60AT** and 70mm **ETX-70AT** refractors hit a new low in pricing for fully computerized scopes . . . and a new high in value! For less than the cost of many single eyepieces alone, you can have a complete scope – with dual axis motor drives, two eyepieces, built-in go-to computer with 1471 stars and objects in its memory for pushbutton astronomy, and more!

They're ideal as starter scopes, as second scopes for casual astronomy, as vacation scopes, as scopes for the kids. Any way you look at them, these new Meade scopes are winners!

Visit our redesigned and expanded website,
now with secure on-line shopping,
www.astronomics.com

3-day air shipping at no extra cost!

We ship by three-day air UPS from our warehouse to our East and West Coast customers at no extra charge above our regular shipping (except for scope cases, Dobsonians, dewshields, and a few other big items). No matter where you live in the 48 continental United States, your order should arrive by the third business day after we ship. UPS can't guarantee 3-day delivery in case of bad weather or during peak seasons, so UPS service guarantees do not apply to this limited time free upgrade if shipments are delayed.

Our free catalog helps you pick the right Meade, Celestron, Questar, Takahashi, or TeleVue scope.

For detailed information on individual products, visit our Web site. Or call us at (405) 364-0858, or e-mail us, for your *free* copy of our catalog AST. It covers all the scopes and accessories we stock – from Apogee, Bushnell, Canon, Celestron, JMI, Lumicon, Meade, Pentax, Questar, Rigel Systems, SBIG, Software Bisque, Takahashi, TeleVue, and more. We'll include our 8-page guide on how to pick the right scope and your discount prices on the 1000+ products we carry. (Sorry, U. S. sales only.) The catalog is yours for only the cost of a one minute phone call. The information we send will make it the most useful minute you'll ever invest in astronomy.

astronomics

Our 22nd year of friendly service, good advice, and money-saving prices.

680 SW 24th Avenue, Norman, OK 73069

Toll-Free Order Line: **(800) 422-7876** Catalogs/Questions/Advice: **(405) 364-0858**

We'll sell you the *right* telescope.

TMB triplet apos!

TMB 180

The buzz on the internet about the new TMB triplet apo refractors is astounding. Visit our website to see the scopes that are the talk of knowledgable astronomers everywhere.

TeleVue? We keep it in stock.

TeleVue TV-85, in stock, **$1995**

Hardly a week goes by that TeleVue doesn't send us copies of warranty cards filled with the glowing comments written by our our customers about the TeleVue scopes they bought from us. But we don't need to be reassured about TeleVue quality. We expect nothing but praise for TeleVue, which is why we stock them in depth. As this was written (9/5), we had dozens of TeleVue scopes in stock, including the TV-101, TV-102, TV-85, Renaissance, Prontos and Rangers galore, and 45 other TeleVue scopes on order.

Pronto, **Ranger**, **TV-85**, **TV-101**, the **TV-102** optical tube, the **Renaissance** – all are built to uncompromisingly high optical and mechanical standards. Their short focal lengths give you an observing flexibility many other scopes lack. Each has the ability to go from very low power wide angle views (as low as 9x in some cases, with a wide 5.7° field) to very high power, all without losing optical quality (one test report said they used an amazing 89x per inch of aperture on TeleVue's least expensive model, the Ranger).

In addition to scopes, we stock TeleVue eyepieces, Barlows, mounts, Sky Tour systems, finders, and accessories in depth. If it's from TeleVue, chances are good we have it in stock for immediate shipment.

TMB 80/6	80mm (3.1") f/6 triplet apo	$\$1390^{00}$
TMB 80/7	80mm (3.1") f/7 triplet apo	1390^{00}
TMB 100	100mm (4") f/8 triplet apo	3290^{00}
TMB 105	105mm (4.1") f/6.2 triplet apo	3290^{00}
TMB 130	130mm (5") f/6 triplet apo	4990^{00}
TMB 152	152mm (6") f/6 triplet apo	6990^{00}
TMB 175	175mm (6") f/6 triplet apo	$11,990^{00}$
TMB 180	180mm (7.1") f/6 triplet apo	8490^{00}
TMB 203	203mm (8") f/9 triplet apo	$19,990^{00}$
TMB 254	254mm (10") f/9 triplet apo	$34,900^{00}$

This Questar costs almost $1000 per inch!

For many people, the mere thought of a 3.5" aperture scope that *starts* at $3395 is enough to curl their toes. But for those who want the best small telescope made, a 3.5" Questar for $3395 is a bargain.

Questar 3.5" Standard **$3395**

Solar filters for eyepiece and finder, built-in Barlow, two ultra-premium eyepieces, a hard case, a star chart on the slide-on lens shade with Moon map beneath – all standard on a Questar . . . and unavailable from the competition.

Want a Questar, the premier portable telescope? We stock them.

> Hey Guys, you deliver!!!! I visited one major advertiser (at least their ads say so) and was told 1 month. I faxed you guys, you called me right back, shipped the telescope right out, I received it before Christmas!!!!!. This gave me 4 additional days of playing around with the scope to see how good it really is. So to sum it all up, The scope is great, the service is also great.
>
> **Customer Quote of the Month #105**

CCD? We carry Apogee LISÄÄ, Meade, and SBIG.

We stock almost all available models of the Apogee LISÄÄ, Meade, and SBIG CCD cameras and auto-guiders (like the new **Apogee LISÄÄ** 659 x 494 pixel guider or imager to the left and the *self-guiding* 1534 x 1020 pixel **SBIG ST-8E** enhanced blue sensitivity imager shown to the right). Our large inventory means the chances are good you won't have to wait to get the camera of your choice. Here are the cameras and guiders we normally keep in stock and their prices.

Apogee LISÄÄ	autoguider or camera	$\$1495^{00}$
Apogee LISÄÄ	camera	1395^{00}
Apogee LISÄÄ	color camera	$\$1395^{00}$
Apogee LISÄÄ	megapixel camera	2595^{00}
Apogee LISÄÄ	megapixel color	2595^{00}
Apogee LISÄÄ	guider + color	2690^{00}
Apogee LISÄÄ	guider + megapixel	3890^{00}
Meade 201XT	autoguider	395^{00}
Meade 208XT	autoguider or camera	495^{00}
Meade 216XT	16-bit camera	695^{00}
Meade 416XTE	camera/guider pack	1995^{00}
Meade 1616XTE	camera/guider pack	6495^{00}
SBIG ST-4	autoguider or cameraa	890^{00}
SBIG ST-5C	track/accumulate camera	895^{00}
SBIG ST-237	track/accumulate camera	1195^{00}
SBIG ST-6B	track/accumulate camera	3025^{00}
SBIG ST-7E	self-guiding camera	2950^{00}
SBIG ST-8E	self-guiding camera	7350^{00}
SBIG ST-9E	track/accumulate camera	3950^{00}
SBIG STV	digital video camera/guider	1595^{00}
SBIG STVD	digital video w/LCD screen	1995^{00}

Our Takahashi sales are now up 263% this year.

Why are more and more people buying more and more Takahashi from us? Is it because we stock more Takahashi than just about anyone else?

While many people swear *at* the long delivery times quoted by some premium refractor manufacturers, most knowledgeable astronomers swear *by* the unsurpassed optical quality and fast delivery of the Takahashi apochromatic refractors we keep in stock.

Takahashi FSQ-106N OTA (4" f/5), **$3475**, on an EM-2 mount, **$2229**. Also shown is the FS-102 4" f/8 OTA, **$2349** w/o finderscope.

Takahashi CN-212 on EM-200 mount, **$8979**.

From the 2.4" **FS-60C** OTA at $829 to the 6" **FS-152** OTA at $8999, we stock Takahashi fluorite apochromatic doublet refractors, mounts, and accessories – so we can deliver scopes *fast*. We can also special order larger scopes with 1-3 month delivery times. Why wait for 1-3 *years* to get your apo refractor or mount from another manufacturer? You can be usually be viewing through a truly superb Takahashi apo only a few short days after you order from us.

We stock complete Takahashi scopes on USD mounts with 50x sidereal dual-axis slewing, as well as apochromatic optical tubes for use on your own mount.

Takahashi FCL-90 ***Sky 90*** OTA (3.5" f/5.6), shown with dew shield retracted, **$2279**

Arriving this fall is Takahashi's unique **FCL-90 *Sky 90*** 90mm f/5.6 refractor. With its self-storing dew shield retracted, as shown above, this remarkable scope is less than 14" long! Combined with a compact P2Z mount, it makes a great traveller you can stow away anywhere.

We also stock the 22" long Takahashi **FSQ-106N** 4" 4-element f/5 dual fluorite apo refractor OTA, with retractable lens shade, shown to the far left at $3475. It's also a great travelling scope. We had 5 in stock as we wrote this on 8/5.

In stock is the unique Takahashi **CN-212** reflector, shown left on a mid-size EM-200 mount ($6999 on a compact EM-10 mount). It's both a fast 8.3" f/3.9 Newtonian for 35mm and CCD astrophotography *and* an f/12.4 classical Cassegrain reflector for high contrast visual observing.

If you want a great scope, and you want it *now*, your first choice should be a Takahashi from ***astronomics***.

One small step for man. One quantum leap for binocular observing!

"Truly a quantum leap in binocular observing." That's how *Sky & Telescope* reviewed the Canon image-stabilized binoculars. They also said "astounding . . . supercrisp . . . particularly impressive was how well these binoculars compared to much larger apertures . . ." No shake, no blur, no jittery images during hand-held, rock-solid, astronomical observing. The newest versions of the image-stabilized Canon binoculars are the 15 x 50mm, shown, and the higher power 18 x 50mm. A useful option with both binoculars is a pair of specially coated fog-proof eyepieces that help keep the images sharp and moisture-free all night long.

$1499
minimum advertised price

Canon

A *6"* Celestron refractor for $799!

We made a special buy on a *very* large quantity of 6" **Celestron CR-150HD** 6" (150mm) 1200mm focal length f/8 German equatorial mount achromatic refractors. They come with a heavy duty CG-5 mount that has manual slow motion controls, setting circles, accessory tray, and adjustable height metal tripod; a 20mm (60x) Plössl eyepiece; 2x Barlow with integral T-adapter; 9 x 50mm finder; 2" focuser with 1.25" adapter; 1.25" star diagonal; and TheSky Level 1 CD-ROM star-charting software! List price is $2390, and normal retail is $1299, but our buying power saves you $500 off the regular price! Less than 200 still available at this very special price.

$799
freight paid!

A Note About Pricing: since ads are written several months before a magazine is printed, MAP and other prices currently in effect may not be the same as those shown in this ad. Our website at www.astronomics.com has the latest discount pricing or call us for current pricing.

24-Hour FAX line: (405) 447-3337 Our e-mail address: questions@astronomics.com
Our multiple award-winning Internet address: www.astronomics.com

Our phone lines are open 10 to 7 CST, Monday thru Friday, and most Saturdays from 12 to 5.
Mastercard, Visa, Discover, American Express. U. S. sales *only*.

No credit card surcharge. $6.95 minimum freight. All returns less freight. Restocking fees apply to returns for credit and to merchandise returned used or damaged.

Although star parties are few and far between this time of year, planetaria, science museums, and astronomical organizations can feed your hunger for knowledge with sky shows, astronomy-related courses, and lectures, regardless of outdoor weather conditions.

If your sense of adventure is calling, join *Astronomy* magazine on a **Northern Lights Tour of Alaska, March 17 – March 26, 2001**. Chase the colorful curtains of the aurora borealis, one of the most spectacular views of the night sky, through Alaska's interior while you experience the magnificent vistas of a great, unspoiled wilderness.

We will begin with five nights in Fairbanks, a major urban center that still maintains a pioneering spirit, then continue to Chena Hot Springs. The evening aurora should produce an impressive show as solar activity is expected to be high in March 2001. During the day, you can take advantage of cross-country skiing, snow shoeing, and ice-skating, or relax in the world-famous hot springs.

Pack your warm clothes and join *Astronomy* on this watch for the magical northern lights. For more information, call Specialty Tours at (800) 677–9412, (727) 796–7555, or e-mail, gs@a1specialtytours.com.

Adler Planetarium and Astronomy Museum Presentations

Chicago, Illinois. **Sears Family Days.** First Saturday of each month, 11:00 A.M. – 3:00 P.M. **Sky Show Presentation: Images of the Infinite: Hubble Space Telescope.** Open run. **StarRider Theater Shows: Blueprint for the Red Planet**, showing through November 23; **Journey to Infinity**, open run. **Exhibit and Lectures: The Remarkable Work of Copernicus, Hevelius and Other Historical Polish Astronomers**, October 6 through January 28. For more information, contact (312) 922–STAR; website, http://www.adlerplanetarium.org.

Hayden Planetarium Lectures and Courses

New York, New York. **The Modern Solar System**, December 9, 16. **Frontiers in Astrophysics Lecture Series**, Kaufmann Theater, 7:30 P.M. — **Evalyn Gates, WIMPS, MACHOS and Little White Dwarfs**, November 27. **Bryan Gaensler, Supernovae and Their Smoke Rings**, December 11. **David Helfand, Chandra: The X-ray Universe Revealed**, January 22. **Distinguished Authors in Astronomy**, Kaufmann Theater, 7:30 P.M. — **Virginia Trimble, Astronomy from 1001–2000 A.D. — The Millennium in Review**, December 18. For more information, contact the Hayden Planetarium at (212) 769–5900; website, http://www.amnh.org/education/hayden.html.

Alan Dyer

Orion peeks through the clouds above this crystalline winter landscape.

THROUGH DECEMBER 31

MarsQuest:Exploring the Red Planet

The University of Alabama at Birmingham. Birmingham is the first stop on the national tour of the MarsQuest traveling science exhibition. For more information, contact Deborah Lucas, (205) 934–8946; e-mail, dgl@uab.edu; website, www.spacescience.org/Outreach/TravSciExhibits/MarsQuest/1.html.

NOVEMBER 17

Shreveport Star Party

The Ralph A. Worley Observatory, Shreveport, Louisiana. Contact Cran Lucas, (318) 797–524; e-mail, clucas@softdisk.com.

NOVEMBER 25

Monthly Star Lecture — Eric Schulman, The History of the Universe in 60 Minutes or Less

Albert Einstein Planetarium, National Air and Space Museum, Washington, D.C. 6 P.M. For more information, contact the National Air and Space Museum, (202) 257–2700 or view the Albert Einstein Planetarium website, http://www.nasm.edu/nasm/planetarium/Einstein.html.

DECEMBER 2000–MAY 2001

Stargazing — 1,000 Years of the Art and Science of Astronomy

Huntington Library, San Marino, California. Exhibition presented by the Huntington Library and NASA's Jet Propulsion Laboratory. For more information, contact Randy Shulman, (626) 405–2293; fax, (626) 449–5656; e-mail, rshulman@huntington.org; website, http://www.huntington.org/.

DECEMBER 2–3

Croxteth Park Star Party Weekend

Croxteth Park and Hall, Liverpool, England. Contact Chris Banks, 0151-547–3459; e-mail, ggastro@liverpool.ac.uk; or website, http://www.liv.ac.uk/~ggastro/new.croxteth.party2.html.

DECEMBER 7

AAS Second Century Lecture Series — Neil Tyson: The Search for Life in the Universe through the Lens of an Urban Astrophysicist

National Air and Space Museum, Smithsonian Institution, Washington, D.C. Neil Tyson is the Director of the Hayden Planetarium in New York City. For more information, telephone the National Air and Space Museum, (202) 357–2700.

JANUARY 7–11

Annual Meeting of the American Astronomical Society

San Diego, California. Held jointly with the American Association of Physics Teachers. For information on scientific programming or exhibit information contact Diana Alexander, (202) 328–2010; e-mail, diana@aas.org; for registration information contact Millie Durbin, (202) 234–7850; e-mail, reg-help@aas.org; or view the AAS website, http://www.aas.org.

JANUARY 9

AAS Second Century Lecture Series — Andrea Ghez: Unveiling a Black Hole at the Center of the Milky Way Galaxy

Reuben H. Fleet Science Center, San Diego, California. Andrea Ghez is a professor at UCLA. For more information, telephone, (619) 238–1233 or view the website, http://blackhole.aas.org/special/centlecture.html

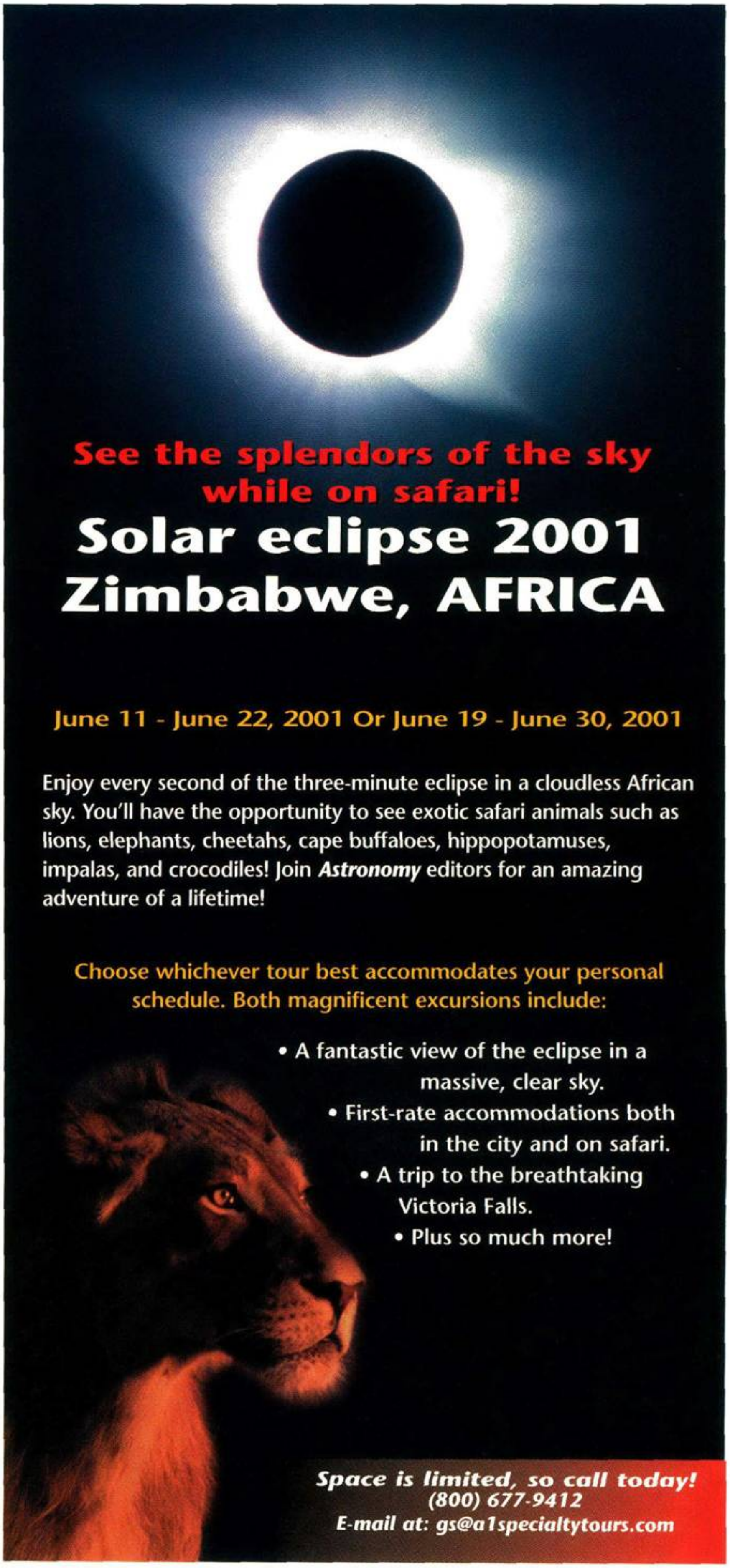
FEBRUARY 19–25

Winter Star Party

Camp Wesumkee, West Summerland Key, Florida Keys, Florida. Sponsored by the Southern Cross Astronomical Society. Advance registration is required; deadline is October 16, 2000. For information, contact Registrars Fred & Lucille Heinrich, 6165 Wiggins Road, Live Oak, FL 32060; (904) 362–5995; fax, (904) 362–5996; e-mail, Heinrich@atlantic.net; website, www.scas.org. For information about accommodations call (800) FLA–KEYS. A

CONTACT

Please submit club announcements four months in advance to Looking Ahead, *Astronomy*, P.O. Box 1612, Waukesha, WI 53187, or to tconley@astronomy.com. Look for additional events at http://www.astronomy.com.


See the splendors of the sky while on safari!

Solar eclipse 2001
Zimbabwe, AFRICA

June 11 - June 22, 2001 Or June 19 - June 30, 2001

Enjoy every second of the three-minute eclipse in a cloudless African sky. You'll have the opportunity to see exotic safari animals such as lions, elephants, cheetahs, cape buffaloes, hippopotamuses, impalas, and crocodiles! Join ***Astronomy*** editors for an amazing adventure of a lifetime!

Choose whichever tour best accommodates your personal schedule. Both magnificent excursions include:

- A fantastic view of the eclipse in a massive, clear sky.
- First-rate accommodations both in the city and on safari.
- A trip to the breathtaking Victoria Falls.
- Plus so much more!

Space is limited, so call today!
(800) 677-9412
E-mail at: gs@a1specialtytours.com

Astronomy's

Retail & Travel Directory

The Directory is designed to be a quick and easy way to locate astronomy-related retail stores, activities, planetariums and observatories. To advertise call toll free 1-888-558-1544 ext. 487

RESORTS

TEXAS - Alpine 79830

TERLINGUA RANCH RESORT

Some of the darkest skies in the United States!
Remote, Quiet & Beautiful!
Adjoins Big Bend National Park.
Two hours from McDonald Observatory.
Cabins, RV Sites & Camping. For information:
www.terlinguaranch.com

HC 65 Box 220 (915) 371-2416

RETAIL SHOPS

ARIZONA - Phoenix 85032

THE ASTRONOMY SHOPPE

Telescopes (Meade, Celestron, Tele Vue®,
Orion, Takahashi) • Spotting Scopes • Binoculars
Eyepieces & Accessories • Maps • Books • Sky Tours
We welcome mail orders. Visa/MasterCard accepted.
astroshop@earthlink.net www.darkskyinc.com

3202 E. Greenway Rd. Suite 1615 (888) 999-6396

CALIFORNIA - Oceanside 92054

OCEANSIDE PHOTO
& TELESCOPE

OPT

20th Annual Winter Telescope

Demonstration, Star Party

& Sale

Saturday, November 11th

CELESTRON DAY

Celestron, Tele-vue® & Discovery reps will be there

Saturday, November 18th

MEADE DAY

Meet the Reps

opt@optcorp.com

1024 Mission Ave. (800) 483–6287

FLORIDA - Sarasota 34236

WOLF CAMERA

Telescopes
Meade
Celestron
Tele Vue®

CCD Equipment
Meade Pictor
Optec Max.
Accessories

WOLF CAMERA

The Largest Telescope Dealer in the Southeast!
New & used telescopes, CCD equipment &
accessories, plus a huge selection of eyepieces and
binoculars! Call Chuck Pisa our staff Astronomer
with 20 years experience today!
www.wolfcamera.com Fax: (941) 952-0278

1055 S. Tamiami Trail (941) 957-4686

You can affordably attract customers
straight to your door with an ad in
Astronomy's Retail & Travel Directory
Learn more about this targeted advertising opportunity call
Kristi Kohlhagen at 1-888-558-1544 ext. 487.

RETAIL SHOPS

GEORGIA - Atlanta 30306

CAMERA BUG

TELESCOPES • BINOCULARS • ACCESSORIES
EYEPIECES • SPOTTING SCOPES • MAPS • BOOKS

Canon • Celestron • Meade • Minolta • Olympus
Orion • Pentax • TeleVue® • Telrad • Rigel

WE SHIP ALMOST ANYWHERE!
www.camerabug.com
Fax: (404) 873-3925
Orders Only: (800) 545-8509

1799 Briarcliff Rd. (404) 873-4513

Subscribe to *Astronomy*! 1-800-533-6644

NEW YORK - Amityville 11701

BERGER BROS.
CAMERA•VIDEO•DIGITAL

In Business Over 50 Years.
"We Don't Just Sell It... We Use It!"

TELESCOPES•BINOCULARS•CAMERAS
We Carry: Meade • Celestron • Swarovski
Leica • Zeiss • Steiner • Fujinon • Pentax
Bausch & Lomb • Bushnell • Nikon • Canon
Catalog Available • We Ship Nationwide
http://www.berger-bros.com

Phone: (631) 264-4160 Fax: (631) 264-1007

209 Broadway (Route 110) (800) 262-4160

TEXAS - Dallas 75252

THE OBSERVATORY, INC.

The Most Complete Telescope Store in Texas

TELESCOPES * MICROSCOPES * BINOCULARS

In the field set-up & instruction with every
Astronomical Telescope purchase
Astronomical Telescopes * Spotting Scopes
Binoculars & Giant Binoculars * Sky Charts
Atlases, Books * Computer Controlled Telescopes
Astronomy Software

Celestron, Meade, Orion, Tele Vue®, Geochron,
Canon, Swift, Sperical Concepts, Fujinon
Home-Dome by Technical Innovations

www.TheObservatoryInc.com

19009 Preston Rd., Suite 114 (972) 248–1450

TEXAS - San Antonio 78250

Analytical Scientific
"The Source For All Your Astronomy Needs"
TM

Visit our showroom and see the largest selection of
telescopes in Texas. Meade, Celestron, Tele Vue®.
Telescopes, binoculars, microscopes, spotting scopes,
accessories, books, charts, posters.
Science, nature and educational items.
E-Mail: asltd@analyticalsci.com

http://www.analyticalsci.com Fax: (210) 520-3344

11049 Bandera Rd. (800) 701–STAR (7827)

TEXAS - Fort Worth 72126

SKYWATCH PRODUCTS

North Texas' Most Affordable
Telescope and Accessories Source
Look Through (day or night) before buying.
Knowledgeable and friendly staff. Extensive showroom
inventory. Astronomy classes available.
Shipping available. Fax (817) 249-5762.
http://members.aol.com/skywatchpr/home.html

7600 Benbrook Pkwy #5 (817) 249-3767

CANADA - Ontario - Toronto M6A 2T2

Shop on-line at www.khanscope.com

MEADE APD PRODUCTS

Our 14th Year!

RETAIL &
MAIL ORDER
NEW & USED
TRADE-INS!!

Celestron • Meade • Tele Vue® • Skywatcher
Binoculars • Spotting Scopes • Books,
Software • Low Prices
All Major Brands on Display
We Welcome trade-ins, Buy Used. Repairs & Service.
Toll Free (800) 580-7160

KHAN SCOPE CENTRE Ph. (416) 783-4140
3243 Dufferin St. Fax (416) 783-7697

CANADA - Ontario - Toronto M6A 3A4

EfstonScience
SERVING OBSERVING SINCE 1970!

Just look for the giant
telescope on our roof!

MEADE APD CELESTRON

Science & Astronomy Superstore.
All major brands on display. Free Literature.
We welcome trade-ins, buy used, do service.
Dobsonians in stock: 6" - 17 1/2"

www.e-sci.com Fax: (416) 787-5140

3350 Dufferin St. (416) 787-4581

Say you saw their Directory Ad in *Astronomy*!

CANADA - Vancouver V6J 1M4

HARRISON

Telescopes, Binoculars, Microscopes, Magnifiers,
Accessories, Books, Meteorological Instruments, Dry Eye
Dew Control Systems. Celestron • Meade • Bushnell •
Bausch & Lomb • Pentaz • Zeiss • Steiner • Olympus
www.aa-astronomical.com
email: harscope@direct.ca Fax: 604-737-4390

1859 West 4th Ave. (604) 737-4303

TRAVEL

CALIFORNIA - Ridgecrest 93555

MAYHUGH TRAVEL'S
ASTRONOMY VACATIONS

2001 ECLIPSE LAND CRUISE
2001 ECLIPSE SAFARI
Lowest Prices Guaranteed!
http://www.mayhugh.com
cst# 2049910-40

701 Perdew Ave. (888) 412–5317

KANSAS - Shawnee Mission 66205

www.AstronomicalTours.net

ASTRONOMICAL TOURS
•Zambia & Madagascar Eclipse 2001•
Alaska Aurora Expeditions
•Shuttle Launches / Space City•
Southern Skies Star Party

4907 W. 57th Terr. (913) 432-4636, toll free (888) 734-0311

Astronomy's Classifieds

ACCESSORIES FOR SALE

Altazimuth platform kits for large dobsonians up to 250 lbs. Digital setting circle kit. Serial EZtracker finds faint objects. Equatorial platform kits. TL Systems, 2184 Primrose Avenue, Vista, CA 92083. (760) 599–4219. tlsystem@ix.netcom.com or http://www.netcom.com/~tlsystem/

Green laser pointer, beam visible at night, ideal for pointing out stars. Much brighter than red lasers, range up to two miles. Handsome, wooden case. Immediate delivery. $275.00 (800) 840-7829. E-mail dean2@uswest.net , website www.laserpointer.net/greenlaspoin.html

Visiting Hawaii? Maui Skies offers star charts, planispheres and other products to enhance star-gazing in Hawaii, plus lots of information. Visit http://www.mauiskies.com or call toll-free 877-211-8669.

BINOCULARS FOR SALE

Do you have BIG EYES®? We have eyes for the stars, the sea, the mountains and more! (914) 944-3391 www.tquestoptical.com

Giant 25/40x100 Military-Spec Binoculars. Spectacular astronomical views! Same product others sell from $1495+ to $3999+. My price only $1299 plus actual shipping!! (412) 243-1569.

Gyro-stabilized, Military-Spec. Binoculars, vastly superior to Canon Image-Stabilized binoculars in stabilization and optical resolution! 12x40, $649; 16x40, $749. (412) 243-1569.

Optolyth Binoculars, finest quality German optics since 1856! Royal roofprism armored series has full phase correction and 95% throughput Ceralin-Plus coatings! Latest models, brand new, full waranty. 9x63, $699; 15x63, $769; 10x45, $619; 8x45, $579. Alpin series also available. See www.optolyth.de (412) 243-1569.

PUBLICATIONS AND WEB SITES

Astrosights. The amateur astronomy web directory and product listings. http://www.astrosights.com

COSMIC PERSPECTIVE, Revolutionary cosmology treatise, reveals big bang fallacy: www.webservr.com/science

NEW BOOK on STAR OF BETHLEHEM, a supernova in Aquila. $10.00 postpaid. www.starofmagi.com

LODGING/TOURS/TRIPS

Ecuador February 2001 with Greg Butcher and Paul Greenfield. BIRDER'S WORLD Magazine is sponsoring a special trip. Join us for one, two or all three segments: Amazon at Sacha Lodge, February 8-12; Andes, San Isidro Lodge and Hotel Tinalandia, February 12-17; Galapagos, February 17-27. For more details, contact Voyagers International (800) 633-0299 e-mail: explore@voyagers.com

Join ASTRONOMY Magazine on an African Eclipse Safari. Zimbabwe - June 10 - July 1, 2001. See the splendors of the sky while on a safari! Enjoy every second of the three-minute eclipse in a cloudless African sky. You'll share the experience with lions, elephants, buffaloes, hippopotamuses, impalas, and crocodiles, and witness the fascinating effect the eclipse has on these creatures. Choose the tour that best fits your personal schedule: June 10 - June 23, 2001 or June 19 - July 1, 2001. Both magnificent excursions include a fantastic view of the eclipse in a massive sky; first rate accommodations- both in the city and on the safari; a trip to the breathtaking Victoria Falls; and so much more. Join ASTRONOMY editors for an amazing adventure of a lifetime! Space is limited–don't delay! For more information, call Specialty Tours toll free (800) 677-9412, (727) 796-7555 or e-mail gs@alspecialtytours.com

MISCELLANEOUS FOR SALE

Comet Poster. Hale-Bopp soaring over clouds, mountains, and trees. In earth tones, this stunning image makes a perfect gift. 13 1/2" x 18". $16.00. 40% discount for orders of 10 or more. Barnard Photos, PO Box 3748, Silver Spring, MD. 20918. e-mail: starmary@earthlink.net

www.UniversalScenics.com View and order online. Unusual gifts! Cosmic scenery for your home or office! Matted laser prints, ready for framing.

ANNOUNCEMENTS/OPPORTUNITIES

Midwest Birding Symposium 2001 is winging its way to Wisconsin! Mark your calendars now for the 2001 Midwest Birding Symposium (MBS). Thursday, August 30 through Sunday, September 2, 2001. Hosted by BIRDER'S WORLD Magazine, EAGLE OPTICS, & the WISCONSIN SOCIETY FOR ORNITHOLOGY. The symposium will offer a varied menu of speakers and field trips of the state, Green Bay is surrounded by wetlands that vary from Lake Michigan shoreline to cattail marsh and sedge meadow. The area lies along major pathways for fall migrants. The theme of Wetlands and Wetland Species will ring through the weekend of activities that will include birding field trips, visits to nature centers , museums and bay cruises. The roster of renowned keynote speakers continues to expand. The symposium will be held at the Regency Suites Conference Center in downtown Green Bay. For accommodations, call (800) 236-3330 and request the special MBS room rate. The Green Bay Area Visitors and Convention Bureau can be reached at (920) 494-9507 for lists of alternative lodging. Sponsors to date include Swift Instruments, Leica Sports Optics, Swarovski Optics, the Green Bay Area Visitor and Convention Bureau, and the Mosquito Hill Nature Center. Additional information can be found on the BIRDER'S WORLD Web site: www.birdersworld.com. For questions or registration, please contact Bill Hubert at (800) 558-1544 ext. 236; by fax at (262) 798-6592 or by e-mail at bhubert@kalmbach.com.

SOFTWARE FOR SALE

Multiple Finding Methods Deep-Sky Objects Locating software for telescopes with equatorial mounts. Free upgrades. Only $19.95. Visit our Web site http://members.efortress.com/pilotstar on the web

TELESCOPES FOR SALE

Meade 8 inch LX200, Equatorial Wedge, 6 eyepieces, 2x barlo, $2000. Call (703) 556-4283 after 6pm EST or e-mail cpgalanc@aol.com

Optolyth Collapsible Armored Spotting Scopes with Ceralin-Plus coatings. 25x70, $649; 30x80, $829. (412) 243-1569.

Optolyth Fluorite Spotting Scopes. Finest quality German optics since 1856. The sharpest and brightest spotting scopes currently on the market! Ceralin-Plus 95% throughput coatings! Fantastic astronomical and terrestrial views! All 80mm and 100mm models available. Brand new with full waranty. Various ultra-wide eyepieces from 20x to 105x. Steep discounts! See www.optolyth.de (412) 243-1569.

Used Telescopes: Takahashi, Pentax, Vixen. Flutes, Ukiyoe Prints. http://www.net0726.ne.jp/~jhnie mi

TELESCOPES WANTED

Wanted: used telescopes and accessories. Contact Gary Hand, 24045 Sugarcane Ln., Gaithersburg, MD 20882. (301) 253–5046.

NEXT month in Astronomy

Jay Gallagher (Univ. of Wisconsin)/WIYN/NOAO/NSF

ASHES TO ASHES

Nearly all the elements essential for life were forged in the nuclear furnaces at the centers of stars and then scattered into interstellar space.

RAYS FROM THE COSMOS

Astronomers discovered cosmic rays nearly 80 years ago. Now a new observatory promises to unlock the mystery surrounding the most energetic of these rays.

SECRET ORIGINS

Both astronomy and space exploration are growing by leaps and bounds, thanks in no small part to a trickle-down effect from military technology.

REIGN OF THE QUEEN

With bright nebulae, rich star clusters, and nearby galaxies, Cassiopeia has all it takes to satisfy backyard observers.

To get your copy of the January issue, visit your local hobby shop or newsstand, or call

1-800-533-6644

Kalmbach Publishing Co., P.O. Box 1612,
Waukesha, WI 53187-1612

Visit our web site at

www.astronomy.com

Online Catalog/Ordering @ shutan.com

We sell a complete selection of new and pre-owned Meade ETX telescopes priced from $299.95

70/AT
We buy used ETX's!
90/RA
90/EC • 125/EC
60/AT

Call for Sale prices!

Meade
8 inch
Dobsonian
$349!

Meade
8 inch
Equatorial
$599!

New!
$500.00 Price Drop Call for info!!

Meade LX90 & LX200

Celestron NexStar Family!

- 5" and 8" Cassegrain
- 4" Maksutov
- 80mm Refractor
- 4.5" Newtonian

Huge Selection of In-Stock Meade Eyepieces and Accessories!

Multi-Coated!

Meade 3000 Eyepieces

Plossl 5, 6.7, 9.5, 16, or 25mm	$50
40mm Plossl	80

Meade 4000 Eyepieces

Super Plossl 6.4, 9.7, 12.4, 15, 20, 26	80
SP32 or 40mm	100
SP56mm	200
Super Wide 13.8	140
Super Wide 18	150
Super Wide 24.5	180
Super Wide 32	240
Super Wide 40	300
Ultra Wide 4.7	170
Ultra Wide 6.7	200
Ultra Wide 8.8	240
Ultra Wide 14	300

ETX Accy's:

Barlow Deluxe APO	$80
Case, soft deluxe	80
Case, hard 90	100
Case, hard deluxe	159
Dew shield sliding	32
Easy-Mount	59
FlexFocus	36
FieldPod-Bogen	159
KwikFocus 90	32
KwikFocus 125	32
MegaPod	239
MotoFocus	100
MotoFocus/Dec	170
Power Package	100
Piggyback 90	62
Piggyback 125	72
Rigel Quickfinder	40
SCT accy adapt	32
SkyMap Pro 6.0	95
Solar filt-dlx-90	82
Solar filt-dlx-125	104
Tele extender	32
Visual back 1.25"	32
Wide-field/deluxe	100

Meade ETX Accy's:

Autostar #497	$150
Ac adapter #541	42
Car cord #607	28
Computer cord #505	26
Case,soft #765	42
Case, hard #773	60
Case, hard #774	100
Case, hard #775	150
Elec focus #1244	Sale
Elec focus #1247	124
Finder 8x25	52
Latitude wt. #1422	30
Prism 45° #932	50
Prism 45° #933	50
Skychart software	55
Tripod- table #880	33
Tripod- table #881	62
Tripod- DlxEq #883	200
T-adapter #64	37

Misc. Meade

AC #541	$42
AC #542	110
Barlow 2x #140	80
Car cord 18 volt	87
Case 7/8/10/12"	call
Compass #605	21

Misc. Meade

Deluxe lat adjust.	$26
Eyepiece holder	26
Epoch 2000 CD	179
Flip-mirror #644	150
Flip-mirror #647	250
Finder 544-8x50	72
Finder 545-8x50	72
Finder 634-6x30	52
Finder brkt-8x50	26
Filter sets of 4	50
Filter ND96 1.25"	20
Focal reducer f:6.3	130
Focal reducer f:3.3	150
Illum 12mm Astro	120
Illum 12mm-CCD	130
Illum 12mm w/cord	80
Illum 12mm-wless	100
Illum 9mm w/cord	130
Illum 9mm-wless	150
Lenshood 7/8"	114
Lenshood 10"	124
Lenshood 12"	174
Magellan	call
Micro-Az control	28
Motor 531/532	104
Nebula 908 B	80
Nebula 908 N	90
Nebula 908 O-III	100
Nebula 911 B	100
Nebula 911 N	120

Misc. Meade

Nebula 911 O-III	$150
Off-axis standard	82
Off-axis deluxe	110
Pictor 201XT	399
Pictor 208XT	499
Pictor 216XT	699
Pictor 416XTE	1999
Pictor 616 filter	699
Piggy brkt 7/8"	34
Piggy brkt 10"	34
Piggy brkt 12"	50
Polar finder 812	50
Prism 2" 90°	105
Prism 1.25" 90°	45
Prism .96-1.25"	32
Prism 1.25" 45°	45
Skylight/seal	50
Tele extender	30
Tele ext-variable	40
T-adapt: SCT	30
T-adapt: vari-proj	40
T-adapt: 1.25"	30
Vari pol 905	50
Weight set 7"	92
Weight set 8"	92
Weight set 10"	99
Weight set 12"	109
Wedge 8"	134
Superwedge	399

Call for other items!

Book & Star Charts

40 More Books & Descriptions @ www.shutan.com

Astrophotography for Amateur	320 pgs.	$35
Astrophotography Introduction	192 pgs.	20
Art & Science of CCD Imaging	176 pgs.	40
Cambridge Guide Stars/Planets	256 pgs.	16
City Astronomy	176 pgs.	19
Deep-Sky Introduction	272 pgs.	25
Monthly Star Charts	68 pgs.	25
Nortons 2000.0	192 pgs.	30
Sky Atlas 2000.0 Deluxe	704 pgs.	50
Telescopes & Techniques	204 pgs.	26
Turn Left at Orion	205 pgs.	25
What's Out Tonight?	xxx pgs.	40

Canon
Image Stabilized
Binoculars!

10x30 • 15x50 • 18x50

We stock 70+ models of binoculars! See 'em at www.shutan.com

Lumicon Filters!
Deep Sky • O-III H-Beta • UHC

Misc.

1000 Oaks 1.25"
Light Pollution Filters:

B-band/N-band	$90
O-III/H-Beta	90

Schmidling

Easy Tester	32

Laser Collimator

at www.shutan.com	100

Rigel

Skylight red/white	30
Quickfinder	40

Starbound

Astro Chair	160

Losmandy

GM-8 w/motor	1465
G-11 w/motor	1865
Dove plate 8"-11"	90
Dove plate 12"	135
125mm ring set/2	160
DCM mount	80

Telrad!

$42

Solar

Solar Filters!

Top-rated! Precision polished **Class-A** glass, triple-coated. Machined aluminum cell. Image is yellow-orange— no need for secondary filtering!

ETX-90mm	$82
ETX-125mm	104
NexStar-5	104
6" full aperture	119
8" full aperture	139
10" full aperture	159
12" full aperture	189

2000
SHUTAN
www.shutan.com

Kendrick

Dew Removers

12v Controller	$70
110v adapter	65
1.25" heater	37
2" heater	39
3" heater (ETX)	42
7/8" heater	52
9"/10" heater	62
12" heater	72

Dew Shields!

ETX-90mm	27
7"/8"	54
10"	64
12"	85

Kwik Focus!

ETX-90mm	33
8"	47
10"	57

JMI

Zero-Image Shift Focusers!

For ALL 8", 10", 12" Meade or Celestron Schmidt-Cassegrains!

NGF-S w/motor	$269
New! NGF-SE w/o motor	169

For Newtonians:

NGF3 *Mini 1.25"*	99
NGF DX3 2-inch	159

Leveling wheels:

for most Meade and Celestron	169
For 12" Meade	229

Celestron

8" SCT's from **$999!**

Celestar-8	$1099
Celestar-8 Deluxe	1699
Ultima 2000	Sale
CR-150HD 6" Refractor with CG-5 mount	Sale
G5 Deluxe w/Quartz motor	799
G8 8" *SCT w/mount*	999

Ultima 2x APO **$Call**

6.3 Reducer **$130**

7x50 Ultima	$249
8x56 Ultima	299
9x63 Ultima	359
10x50 Ultima	259
20x80 Deluxe	469

Pentax

65° Field!

7mm	$269
10.5 or 14mm	259
21mm	259
28mm	249
40mm (2")	269

LX200 *Easy-Mount*

11.5" x 20"
$100

- A must for all LX owners
- Fits 7"-12" Meade scopes
- Bumper-type registration
- 1/4" anodized alum-CNC
- Holds 12 eyepieces!
- Holds keypad securely

TeleVue-101 • TeleVue 85 Pronto • Ranger

Quick Point	$40
Starbeam-T	180
2" diagonal SDG	190
1.25" 90° diag	80
Field Flattener	88
BinoVue New!	1030
TelePod w/tripod	325
Paracorr 2"	235
Zoom 8-24mm	214

Plossl-50°

8, 11, or 15	84
20 or 25mm	97
32 or 40mm	114
55mm	230

Radian-60°

3, 4mm ea.	230
5, 6, 8mm ea.	230
10, 12mm ea.	230
14, 18mm ea.	230

Panoptic-68°

15mm	$210
19mm	240
22mm	280
27mm	330
35mm	365

Nagler-82°

4.8mm	175
7mm	220
9mm	240
12mm Type4	340
17mm Type4	370
22mm Type4	445
31mm Type5	599

Barlows

1.25" 2x or 3x	109
1.25" 2.5x or 5x	180
2-inch 2x	170
2-inch 4x	265

Order Toll-Free or Online! Call us or visit our web site for **Y2000 Discount Catalog!** Order by **NOON** for same-day shipment. C.O.D. available, please inquire. We ship most accessory orders up to 5 lbs. for just **$7** via UPS Ground. **Non-Meade** products are available for **Worldwide** shipment-- information at www.shutan.com. Shutan is family **owned** and **operated** since 1918! *Prices, specifications, and trade-in offers subject to change and do not include shipping/handling.* **© 9/2000 SC&V.**

SHUTAN
camera & video

We welcome bids & PO's from Schools!

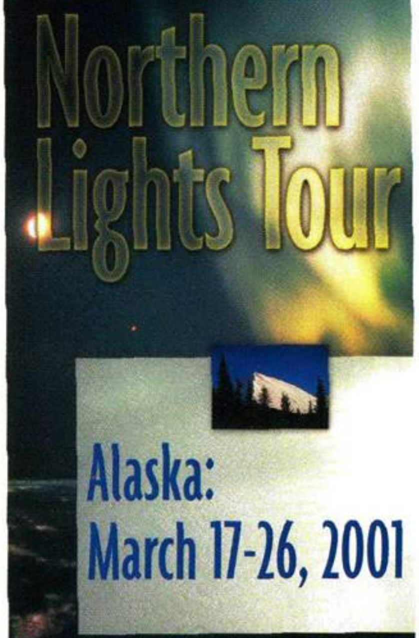
Toll-Free 800-621-2248

Illinois 847-367-4600 • www.shutan.com
100 Fairway Dr. • Vernon Hills IL • 60061

We Moved!

AD INDEX

AES Amateur Electronic Supply 105
Adirondack Video Astronomy 108
Adorama 94, 95
American Paper Optics, Inc. 36
Any Cosmic Night 106
Arcron Zeit 34
Astro Haven 105
Astro Stuff 101
Astro-Physics 106
Astrographics Publishing 35
Astronomical Adventures 106
Astronomical Society of the Pacific 109
Astronomics 114, 115
Astronomy Shoppe 111
Beigle/Bryant Engineering 107
Bethany Sciences 106
Casper, Michael I Meteorites 107
Cavendish Press 111
Celestron International 27, 74, 75
Centre for Astronomy 97
Coulter Optics 100
Davis Instruments 100
Discovery Telescopes, Inc 85
Eagle Optics 97
Earth and Sky 107
Edmund Scientific Company 99
Edward R Hamilton Bookseller 107
eHobbies.com, Inc. 20, 21, 22, 23
Equatorial Platforms 106
Exploring the Planets 63
F. C. Meichsner Company 101
Focus Camera 112, 113
Fujinon 15
Glatter, Howard 108
Gould Precision Optics 105
Grove's Dictionaries 35
Hands On Optics 109
Hardin Optical Co. 31, 109
Innovations in Travel 108
Internet Telescope Exchange 107
JMB, Inc 100
Jim's Mobile Industries 88, 89
Kalmbach Publishing Co. 16, 17, 104, 111, 117, 119, 121
Kendrick Astro Instruments 63
Learning Technologies, Inc. 98, 106
Lumicon 90, 91
Lymax Earth, Sky & Astronomy 107
Mag One Instruments 108
Marketplace Pages 105, 106, 107, 108, 109
Mars Planetary Development 121
Meade Instruments Corp 2, 3, 7, 8, 9, 10, 11, 12, 13, 25, 130
Meta Research 15
Minerva Press 105
Mountain Skies Astronomical Society 105
National Academy Press 34
New England Meteoritical 109
New Mexico Skies 107
Newport Glass Works 109
Novaspace 107
Obsession Telescopes 106
Oceanside Photo & Telescope 98
Optical Guidance Systems 109
Orion Telescopes & Binoculars 18, 19, 82, 83, 129
Parkside Optical, Inc. 110
Peet Brothers, Inc. 109
Pegasus Optics 105
Pocono West Optics 84
Princeton University Press 85
Radio City 108
Rivers Camera Shop 110
Roger W. Tuthill, Inc. 111
Rome Telescope Company 109
SAC Imaging Systems 106
SCS Astro 105
Santa Barbara Instrument Group 93
Science Art Co. 106
Science Connection, Inc. 106
Scope City 102
ScopeTronix 108
Shutan Camera & Video 120
Sirius Observatories 106
Sky Watchers Inn 106
Skytent International 111
Software Bisque 103
Star Tek Industries 109
Starmaster Portable Telescope 109
Starry Night 29
Starsafaris.com 31
Starsplitter Telescopes 111
Surplus Shed 109
T & T Binocular Mounts & Beyond LLC 108
Technical Innovations 111
The Teaching Company 33
Travel Wizard 105
Travel Quest 109
Universal Workshop 107
What In the World 101
Wholesale Optics 110
Woodland Hills Photo Images 31



JOIN Astronomy MAGAZINE ON A

Northern Lights Tour

Alaska:
March 17-26, 2001

Chase the colorful curtains of the aurora borealis through Alaska's interior with *Astronomy* Magazine. Along with catching one of the most spectacular views of the night sky, you will experience the magnificent vistas of a great, unspoiled wilderness.

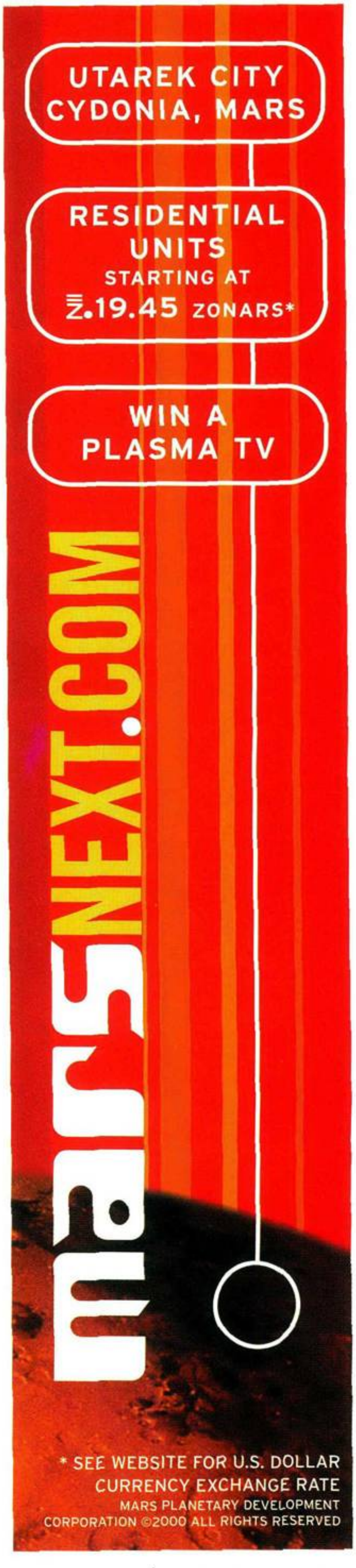
Our experience begins with five nights in Fairbanks, one of Alaska's major urban centers that still maintains a pioneering spirit. You can arrange to shop, downhill ski, attend the Ice Festival, or simply curl up with a good book.

The adventure continues in Chena Hot Springs, 60 miles from Fairbanks, and far from light pollution. The evening aurora should produce an impressive show as solar activity is expected to be high in March 2001. During the day, you can take advantage of cross-country skiing, snow shoeing, and ice-skating. Or relax in the world-famous hot springs.

The breathtaking scenery is guaranteed to put you on sensory overload. Whatever your choices for the daylight and evening hours, pack your warm clothes and join *Astronomy* on this watch for the magical northern lights in the heart of Alaska. See you there!

For more information call Specialty Tours today at:
1-800-677-9412 (US only) or 727-796-7555
www.alspecialtytours.com

Space is limited – don't delay!



* SEE WEBSITE FOR U.S. DOLLAR CURRENCY EXCHANGE RATE
MARS PLANETARY DEVELOPMENT CORPORATION ©2000 ALL RIGHTS RESERVED

LUNAR ECLIPSE

Following the Moon

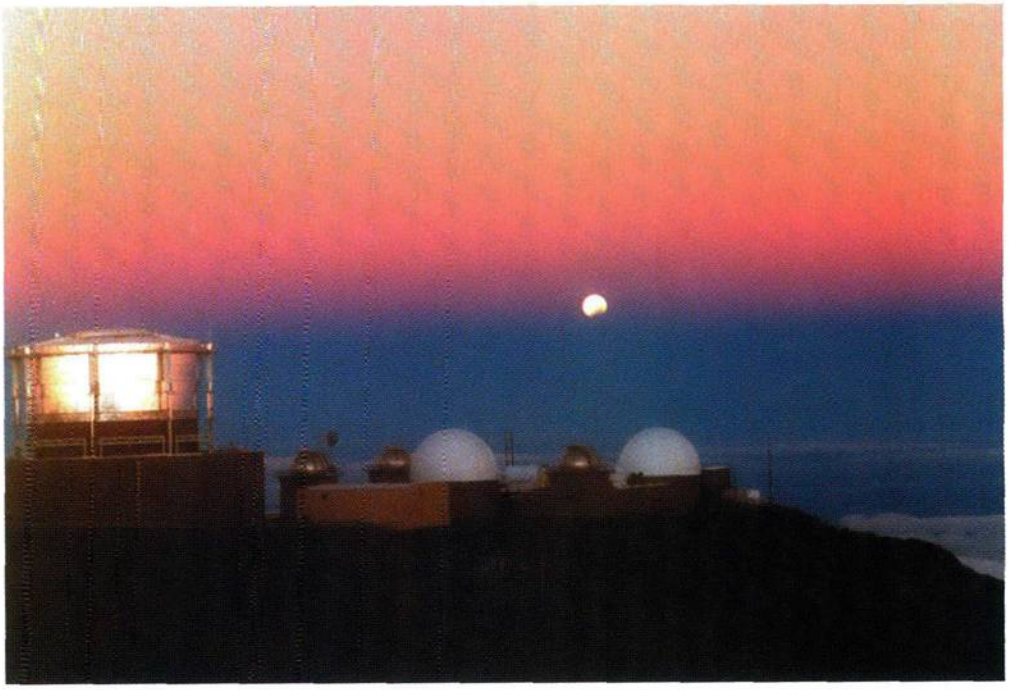
A night on Haleakala reveals a beautiful lunar eclipse.

▶ Haleakala, the 10,000-foot-high volcanic crater that dominates the Hawaiian Island of Maui, is revered by native Hawaiians and tourists alike as "the temple of the sun." Every dawn brings hundreds of visitors to the top of this National Park to witness sunrise, as the ancients have done for millennia. But on the night of July 15–16, 2000, Haleakala was transformed into the temple of the moon.

My journey to Hawaii to watch the lunar eclipse began back in January. I was amazed by the total lunar eclipse that graced North America. I started my research the following morning on the next lunar eclipse.

Although the next total lunar eclipse was only six months away on July 16, we East Coast residents were out of luck. Even on the West Coast, the moon would set prior to totality. Hawaii, though, was well situated. I have traveled many miles for total solar eclipses, but it seemed extravagant to do the same for a mere lunar event. So I resigned myself to waiting until May 16, 2003, for my next local total lunar eclipse.

Then something really nice happened. This spring I fell in love with a wonderful lady, who also showed a great fondness for the beautiful natural wonders of our



Lunar Eclipse from Haleakala

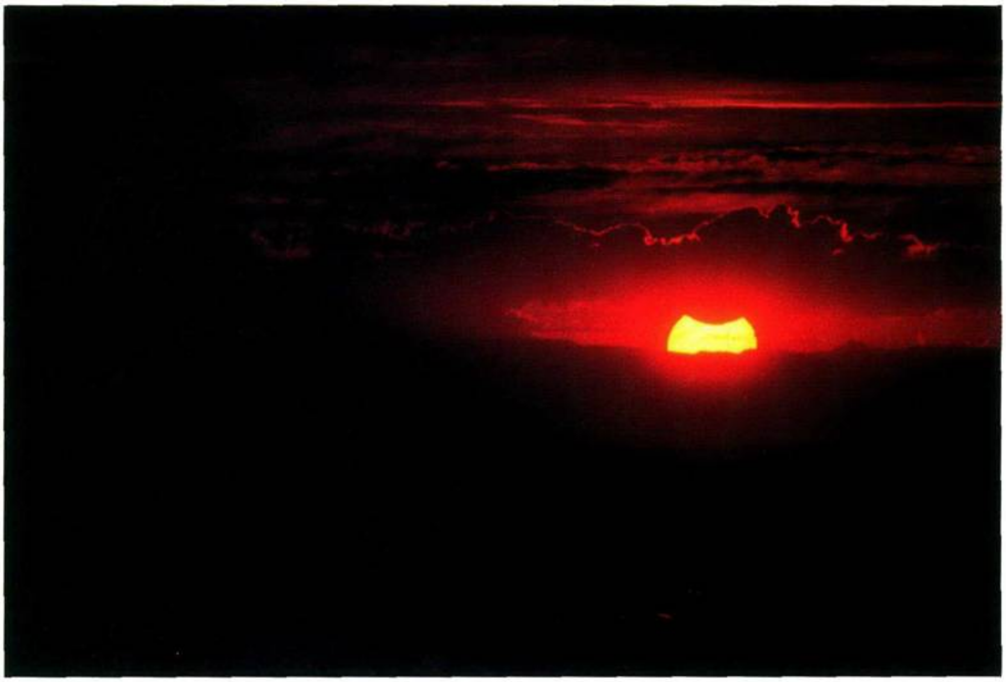
JAMES A. ROSENSTOCK

(80mm lens, ISO 400 film, taken July 16, 2000)

Partial Solar Eclipse through Sunset's Atmosphere

STEVE R. JACKSON

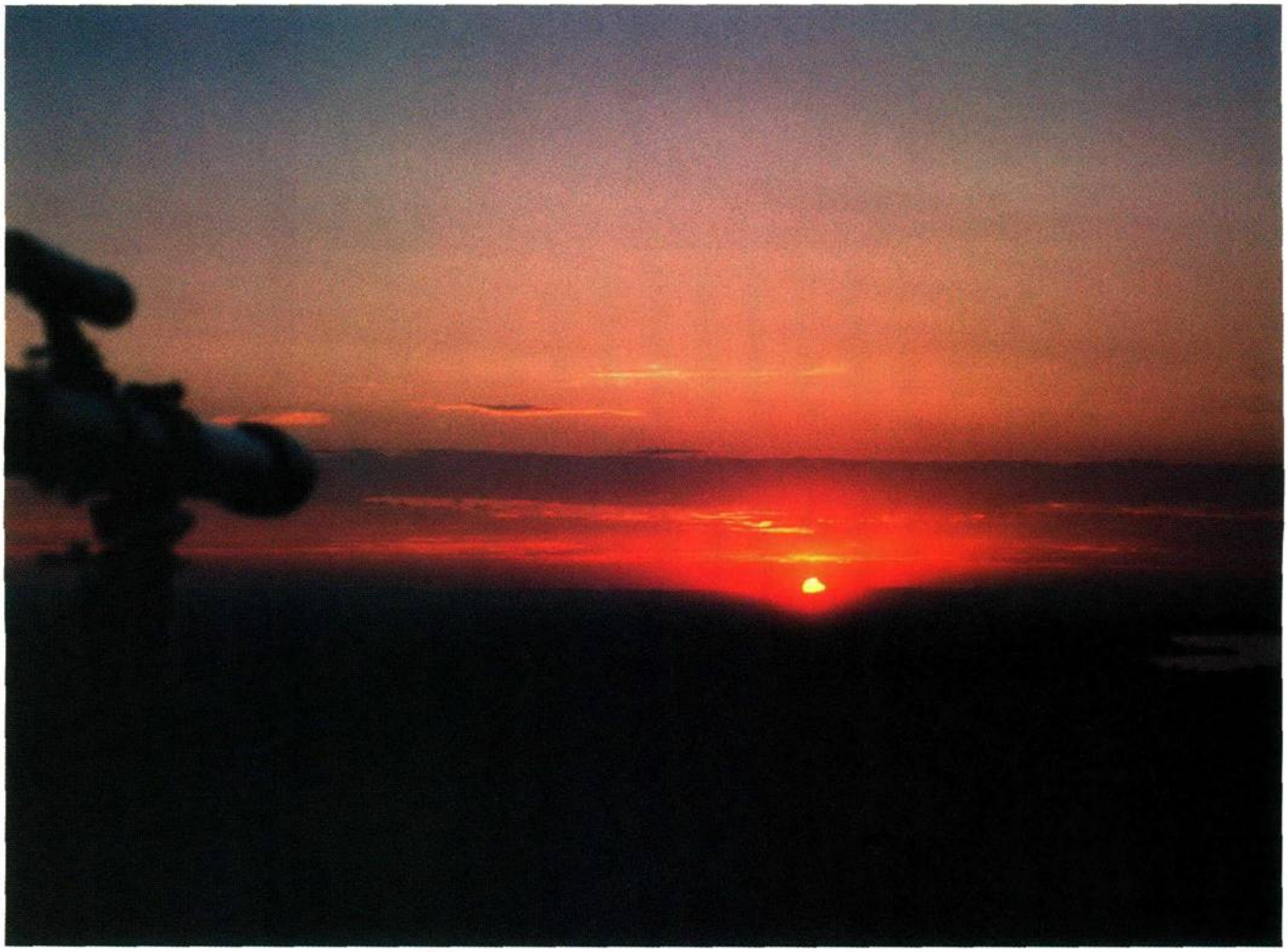
(300mm lens at f/5.6, Kodak Gold 100 film, taken July 30, 2000, from John Little State Reserve, California)



Partly Cloudy Partial Eclipse

ROY GEPHART

(300mm lens at f/16, Kodachrome 64 film, 1/125-second exposure taken July 30, 2000, from the Cascade Mountains, Washington)



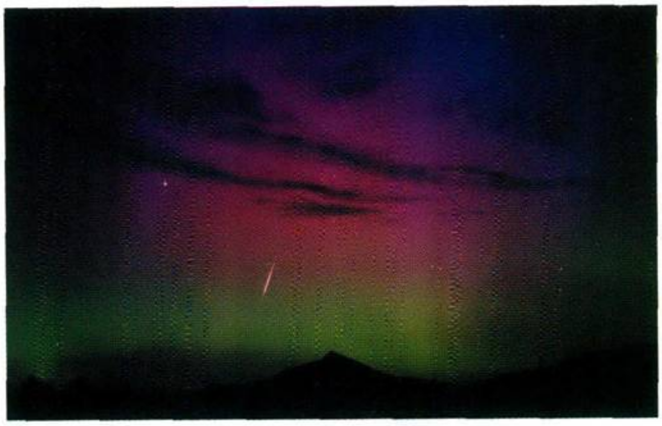
Sinking Solar Eclipse

RALPH MERLETTI

(50mm lens, Fuji Super HQ 100 film, taken July 30, 2000, from El Dorado Hills, California) world. She particularly enjoys tropical islands, exploring lush terrestrial habitats, and the beauty of the coral reefs just offshore. So I asked Grace what she thought of visiting Hawaii in July. I mentioned that I'd certainly like to see the lunar eclipse on the 16th, and as part of our first idyllic vacation together, it made the trip justifiable.

Once on Maui, we made a day trip to the top of Haleakala, up a winding mountain road that was alternately spellbinding and terrifying. After visiting the summit, we knew where we had to go to view the eclipse. It's not surprising that the native Hawaiians regard this place as sacred. At 10,000 feet, it's above most of the clouds. It's a land of mist and rainbows, spectacular views, and vegetation that doesn't exist anywhere else. Eclipses are scientific events, all right, but they're natural science and also spiritual, and this was clearly the most spiritual spot on the island.

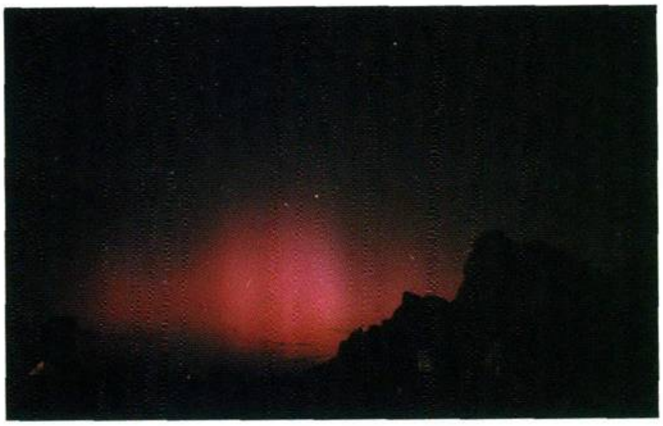
On eclipse night we arrived at the summit after dark but well before the umbra began to sweep across the face of the moon. About a dozen others had chosen this location; frankly, we were surprised so few people were there for this, what would be the longest lunar eclipse of our lifetimes. It was clear and bright as the umbra began to shade the moon. But as the eclipse neared totality, waves of mist began sweeping in. It was fortunate that totality lasted so long (close to two hours), because the mist would only occasionally let up for a couple of minutes. What an amazing sight for this suburban astronomy buff — when the haze cleared, the starriest skies of my life fairly jumped



Summer Aurora and Perseid

JIMMY WESTLAKE

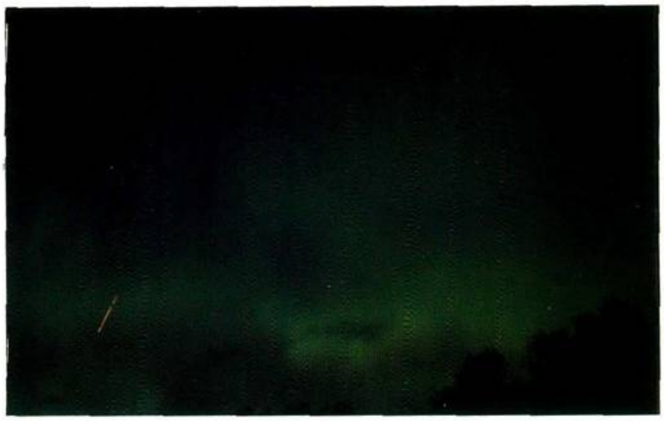
(50mm lens at f/1.8, Kodak Max 400 film, 20-second exposure taken 3:45 A.M. MDT August 12, 2000, from Hahn's Peak, Colorado)



El Paso Aurora and Perseid

CHRIS GROHUSKO

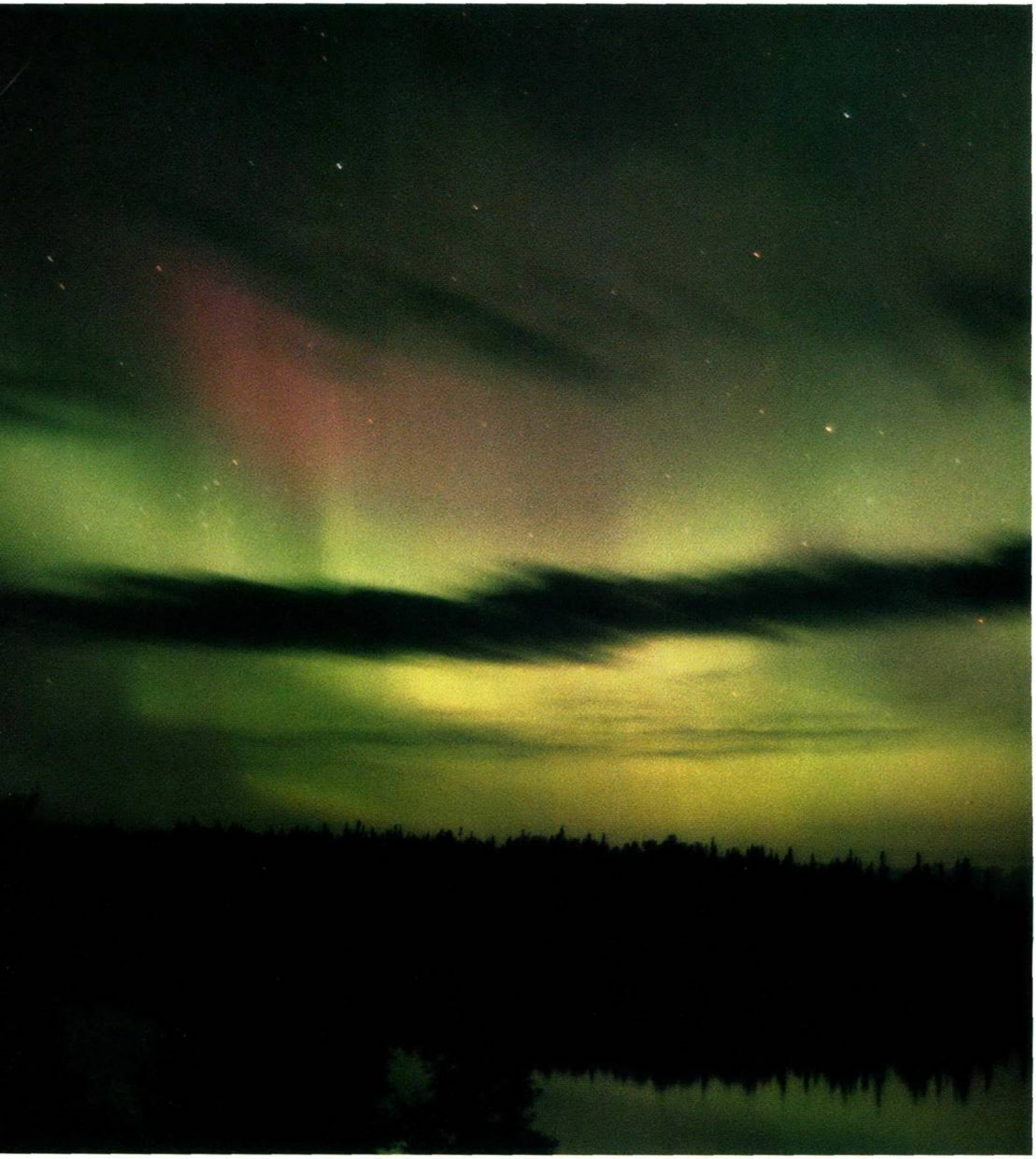
(28mm lens, Fuji Superia Xtra ISO 800 film, 15- to 30-second exposure taken 4:30 A.M. MDT August 12, 2000, outside of El Paso, Texas)



Perseid and Northern Lights

STEVE MILAZZO

(35mm lens at f/5.6, Kodak 800 ISO film, 35-second exposure taken August 12, 2000)



Canadian Aurora and Meteor

STAN RICHARD

(28mm lens at f/3.5, Fuji Superia 800 film, 15-second exposure taken 12:45 A.M. EDT June 29, 2000, from Norse Lake, Ontario, Canada) out at me. Never have I seen such detail in the Milky Way. I was struck by the change in the night sky — and on the ground — when the bright full moon transformed into a dim copper orb.

As totality ended, a steady procession of cars began arriving at the summit. Sunrise on Haleakala is a daily tourist ritual. By the time predawn light began to glow in the east, the place was crawling with visitors. Our temple of the moon had been transformed into a tourist trap. Grace told me she felt like she had stumbled into a *Simpsons'* episode. Then we noticed that nobody was on the west side of the mountain. The colors of sunrise were just as beautiful in the west, and that's where I took this photo of the moon, still a little notched by Earth's shadow, setting behind the observatories. A little later we watched rainbows form and disappear in the swirling mist opposite the sunrise — another sight all the *Simpsons* missed.

I could tell you about the snorkeling, the ferns, and the waterfalls, but let's just say we'll be going back to Maui, and probably long before August 28, 2007, when totality once again will grace the Hawaiian Islands.

James A. Rosenstock lives in Fort Washington, Maryland.

Share Your Stories

Send your 500- to 800-word reports describing your observing experiences to:

Hot Shots, *Astronomy* magazine, P.O. Box 1612, Waukesha, WI 53187-1612

Or e-mail them to:

hotshots@astronomy.com

Delta 2 Rocket Satellite Trail

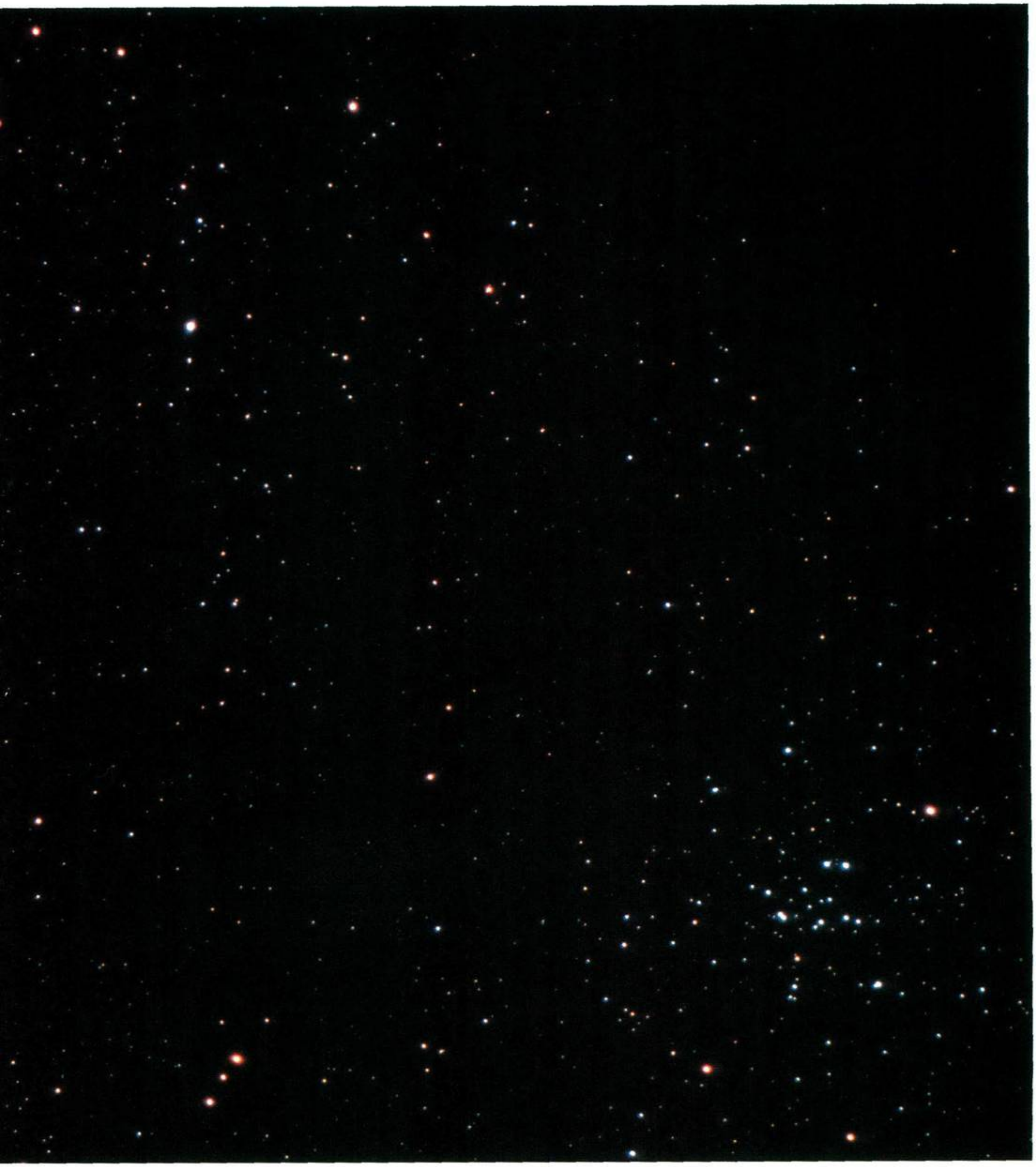
PETER WARD

(15mm lens at f/2.8, ISO 1600 film, 9-minute exposure taken August 9, 2000, from Mount Laguna, California)

Perseid Meteor

PETER WARD

(28mm lens at f/2.8, ISO 1600 film, 9-minute exposure taken August 9, 2000, from Mount Laguna, California)



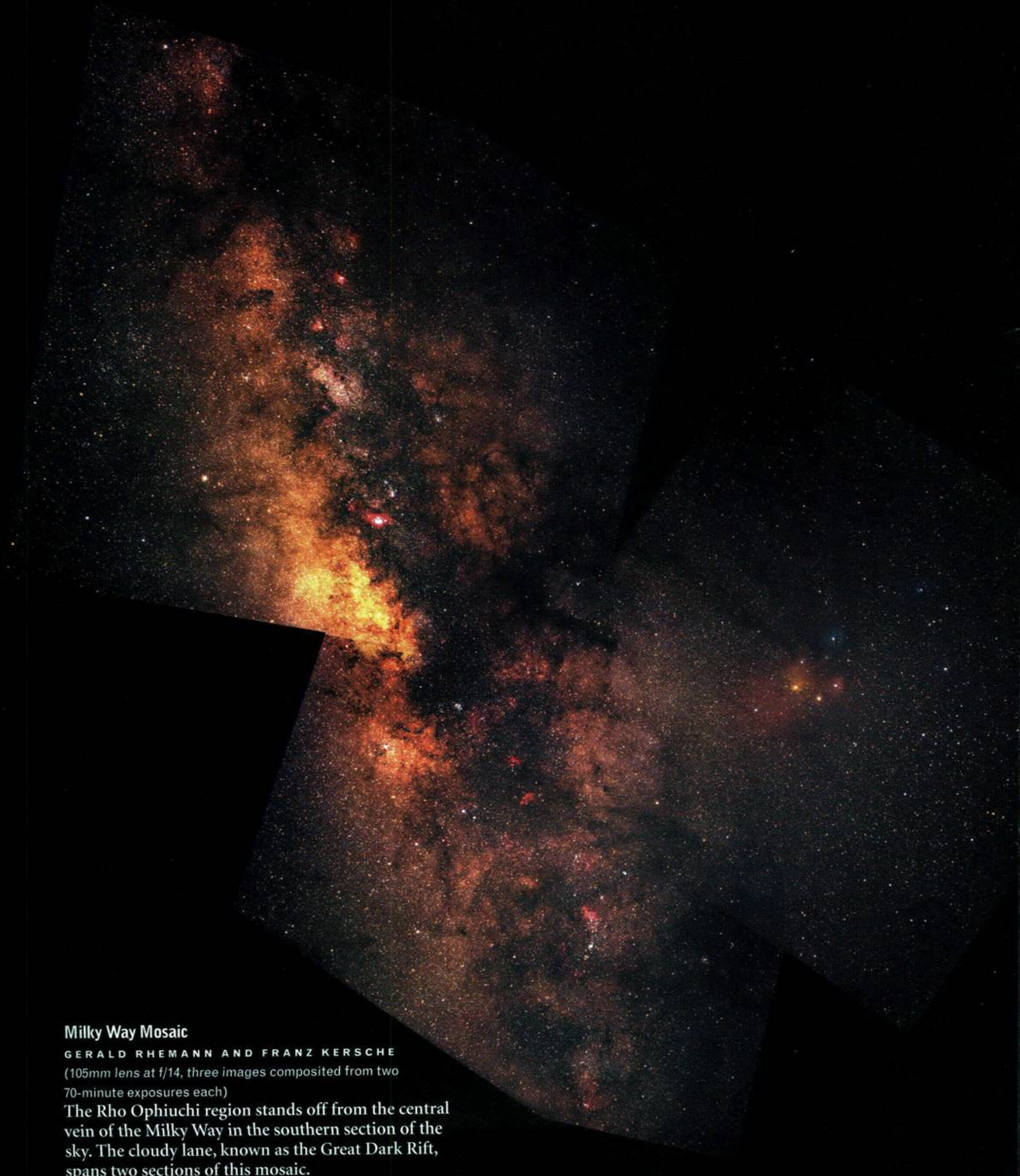
LINEAR and M34

ALLEN HWANG

(6-inch refractor at f/5.2, Elitechrome 200 film, 7-minute exposure taken June 29, 2000)

ULTIMATE EXPOSURE

This month's best astrophoto



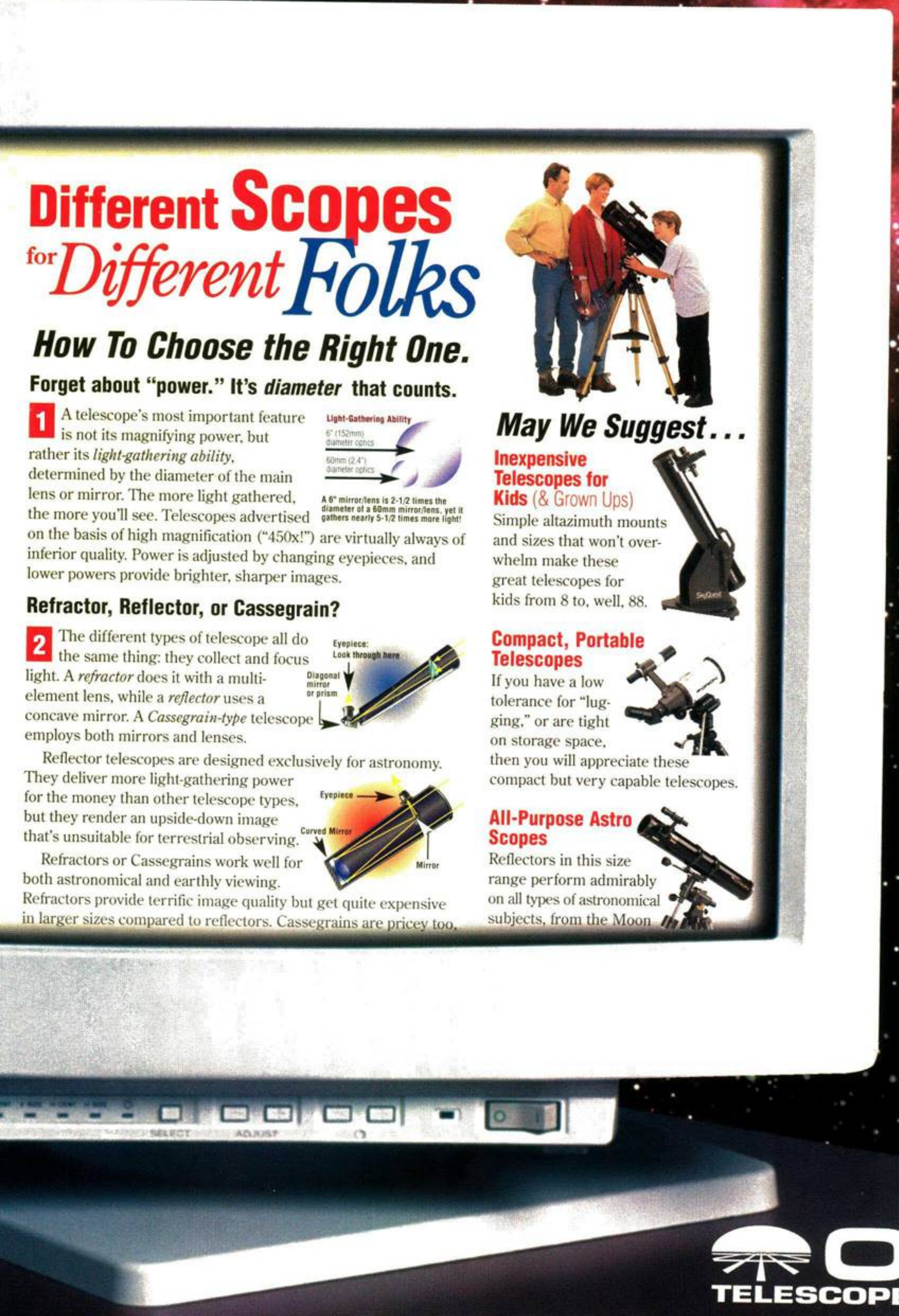
Milky Way Mosaic

GERALD RHEMANN AND FRANZ KERSCHE

(105mm lens at f/14, three images composited from two 70-minute exposures each)

The Rho Ophiuchi region stands off from the central vein of the Milky Way in the southern section of the sky. The cloudy lane, known as the Great Dark Rift, spans two sections of this mosaic.

telescope.com



Different Scopes for *Different* Folks

How To Choose the Right One.

Forget about "power." It's *diameter* that counts.

1 A telescope's most important feature is not its magnifying power, but rather its *light-gathering ability*, determined by the diameter of the main lens or mirror. The more light gathered, the more you'll see. Telescopes advertised on the basis of high magnification ("450x!") are virtually always of inferior quality. Power is adjusted by changing eyepieces, and lower powers provide brighter, sharper images.

Light-Gathering Ability
6" (152mm) diameter optics
60mm (2.4") diameter optics

A 6" mirror/lens is 2-1/2 times the diameter of a 60mm mirror/lens, yet it gathers nearly 5-1/2 times more light!

Refractor, Reflector, or Cassegrain?

2 The different types of telescope all do the same thing: they collect and focus light. A *refractor* does it with a multi-element lens, while a *reflector* uses a concave mirror. A *Cassegrain-type* telescope employs both mirrors and lenses.

Reflector telescopes are designed exclusively for astronomy. They deliver more light-gathering power for the money than other telescope types, but they render an upside-down image that's unsuitable for terrestrial observing.

Refractors or Cassegrains work well for both astronomical and earthly viewing. Refractors provide terrific image quality but get quite expensive in larger sizes compared to reflectors. Cassegrains are pricey too,

Eyepiece: Look through here
Diagonal mirror or prism
Eyepiece
Curved Mirror
Mirror
SkyQuest
SELECT
ADJUST

May We Suggest . . .

Inexpensive Telescopes for Kids (& Grown Ups)

Simple altazimuth mounts and sizes that won't overwhelm make these great telescopes for kids from 8 to, well, 88.

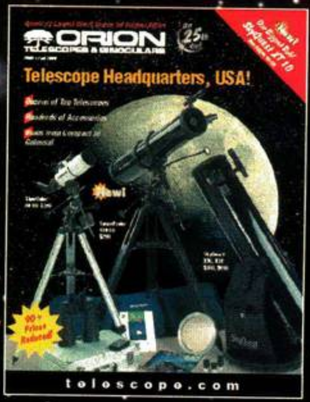
Compact, Portable Telescopes

If you have a low tolerance for "lugging," or are tight on storage space, then you will appreciate these compact but very capable telescopes.

All-Purpose Astro Scopes

Reflectors in this size range perform admirably on all types of astronomical subjects, from the Moon

- ▶ 1000+ telescopes, binoculars, & accessories
- ▶ New product updates
- ▶ Web-only specials
- ▶ Learning center
- ▶ Telescope buyer's guide



ORION TELESCOPES & BINOCULARS
25th
Telescope Headquarters, USA!
New!
teloscope.com

FREE 100-Page Catalog!
(800) 447-1001 or
request it online

Our 25th Year!

ORION
TELESCOPES & BINOCULARS

Everything for the Amateur Astronomer—Delivered Direct

Images with the Meade 10" LX200 Schmidt-Cassegrain telescope by Philip Perkins of Wiltshire, England. *Clockwise from upper-left:* **The Rosette Nebula (NGC 2237) in Monoceros; the Flame Nebula (NGC 2024) in Orion; Spiral Galaxy (M100) in Coma Berenices; Spiral Galaxy (M81) in Ursa Major.** Comments Mr. Perkins: "I believe that my astrophotographs genuinely represent what the typical user may achieve with the 10" LX200…my LX200 has not been modified in any way; I use it just the way Meade manufactured it, and I think the results speak for themselves. The telescope's optics, stability, and tracking accuracy are fully up to the demands that my photographic program requires."

The largest-selling telescopes in the world.

ADVANCED PRODUCTS DIVISION
Meade Instruments Corporation
6001 Oak Canyon, Irvine, California 92618 ■ (949) 451-1450
FAX: (949) 451-1460 ■ *www.meade.com*

© 2000